A Consensual Sustainability Model

A Consensual Sustainability Model: a decision support tool for use in sustainable building project procurement

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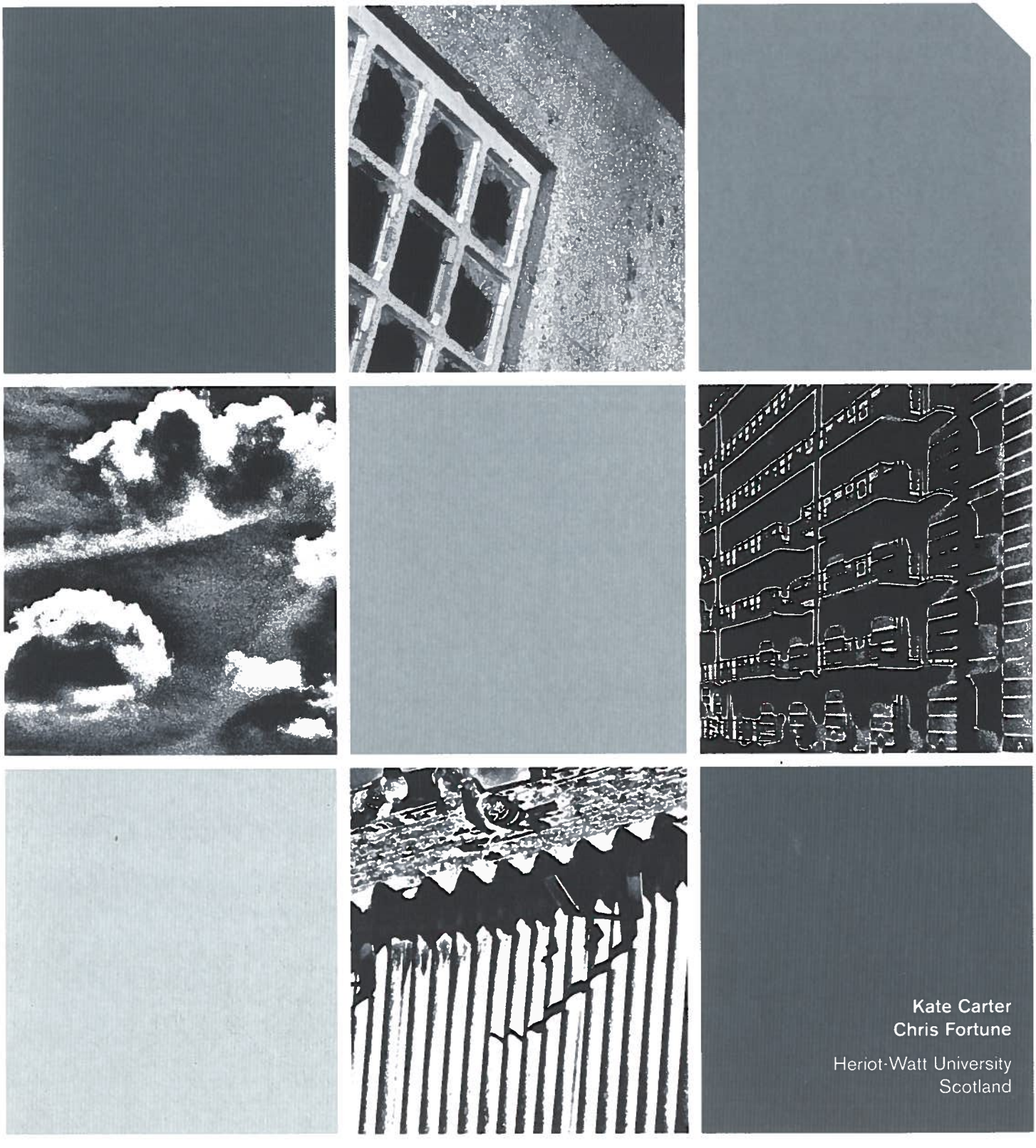

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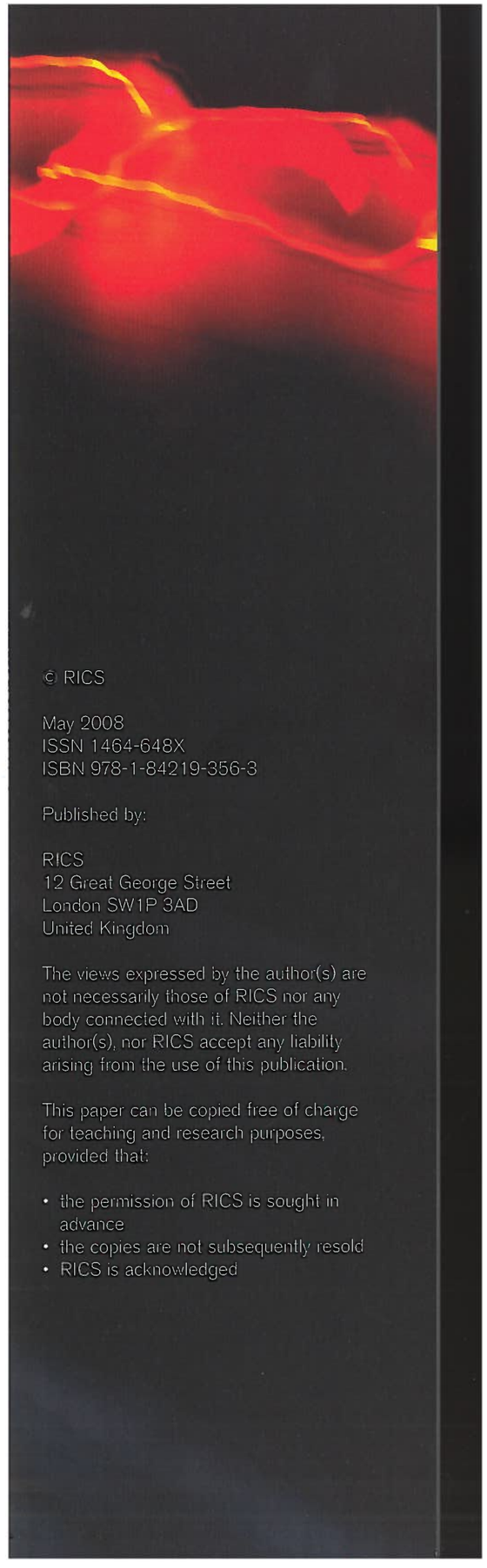

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Abstract

In terms of policy level interpretation there is a general consensus on the principle of sustainability. The UK Government has adopted the principles of sustainable development and encourages its integration into all publicly funded construction work. Social housing projects have a requirement to demonstrate sustainability, yet the people involved in their procurement have a varied understanding of the term. This research explores the interpretation of sustainability from the perspective of a housing association and develops a toolkit, 'ConSus' to enhance the delivery of sustainability in the procurement of social housing.

There is significant activity associated with sustainability in the social housing sector; however, a consensus on project level definition is yet to emerge. A grounded theory approach has been used to explore the interpretation of sustainability in the procurement of social housing. This led to the development of a set of paradigm models which help explain the fundamental contextual issues and actions relating to the sustainable development of social housing. This work identified the need for a structured approach to the delivery of sustainability in the procurement framework. The second phase of the research addressed this issue. A mixed methodology was used to develop a framework for stakeholders to reach consensus on sustainability in the procurement system for individual projects. Based on the Delphi method, 'ConSus', is a web-based decision support tool enabling the explicit integration of sustainability into the procurement process. Development and testing of the tool allowed specific issues to be plotted against the paradigm models developed in the first phase of research. This approach provides a practical tool for use in the social housing sector. It allows mapping of project priorities against policy objectives and presents a vital support framework for enhancing the delivery of sustainable development. Testing in the social housing sector has demonstrated the ease that 'ConSus' provides in identifying the priorities for the delivery of a sustainable social housing scheme. Further work on the development of the model will be undertaken to improve the interface of the toolkit for the full range of project stakeholders.

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In addition the researchers wish to acknowledge the support of the practitioners who gave of their time, experience and expertise so as to allow the work to develop a greater understanding of the issues central to this study, namely, how the differing features of sustainability can be incorporated into procurement systems used for social housing projects.

Contents

1 Introduction

1.1 Background to the study

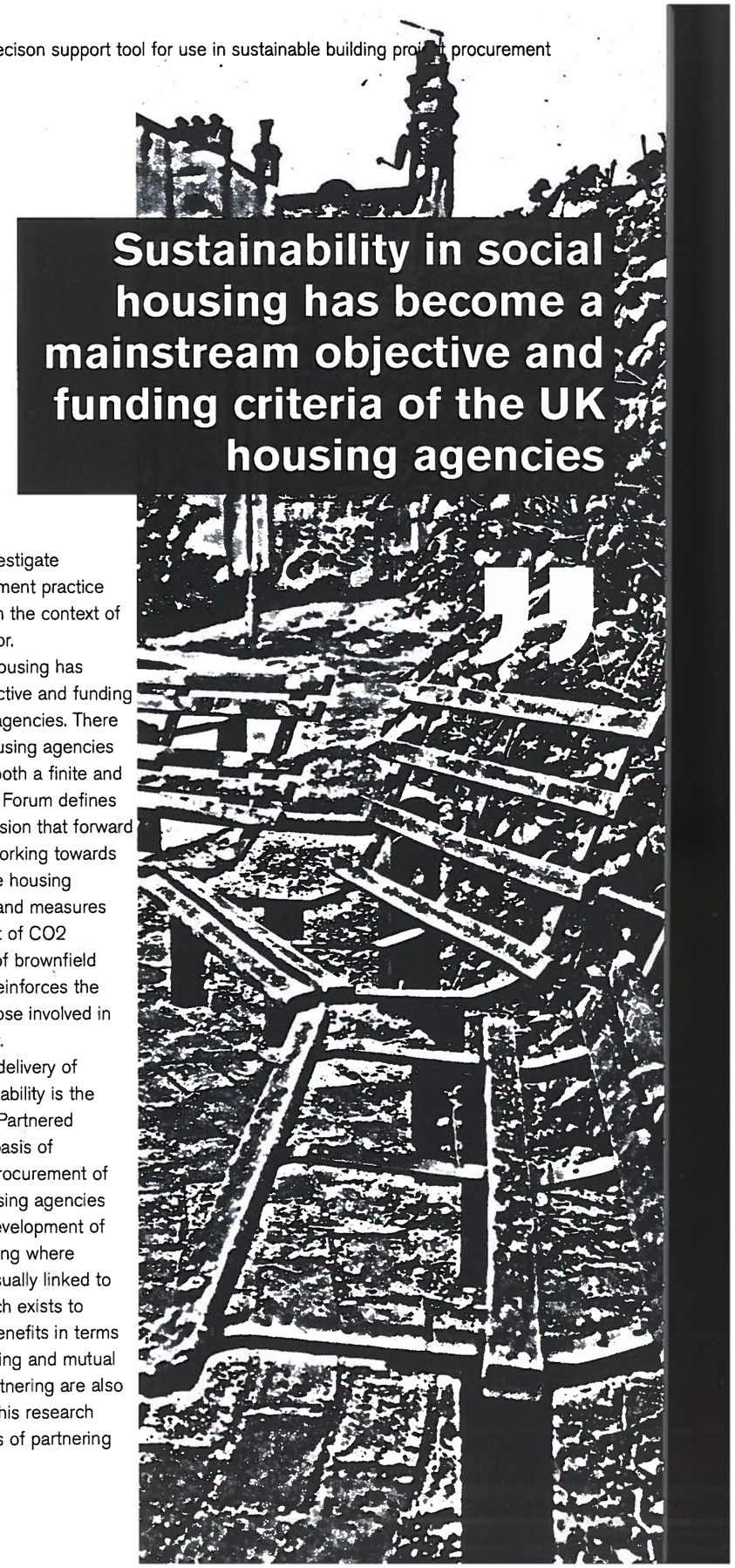
Sustainable development is a dynamic process which enables all people to realise their potential, and to improve their quality of life, in ways which simultaneously protect and enhance the Earth's life support systems. (Forum for the Future: Annual Report 2001:1)

The concept of sustainability, defined in the Bruntland Report (1987) gave economic and social emphasis to a previously environmentally biased issue. This broad definition is now deeply embedded in development policy across the globe and filters down through policy objectives to activity at project level. However, delivering a project, while addressing social, economic and environmental sustainability, has become increasingly complex.

The significance of the construction sector to the success of sustainability was recognised at the 1992 Rio Summit with the formulation of Agenda 21. As a result the UK Government has now adopted the principles of sustainable development and encourages its integration into all publicly funded construction work. Rethinking Construction (Egan 1998) highlighted the need for drastic improvement within the construction industry as a whole. Social Housing was identified within this report as the sector most able to deliver improvements to the housing industry and the Housing Forum was launched to drive an agenda of change for housing. In 1999 a working group was set up to investigate the principles of sustainability in social housing. It soon became clear that sustainability was a vital ingredient to providing the sought after improvements in the housing sector. This led to the housing agencies adopting sustainability as a funding criterion.

Housing Associations (HAs), the providers of social housing, are faced with a requirement to develop sustainable social housing projects in order to secure funding from the housing agencies. The problem faced by both funding agencies and the housing associations is how to transfer policy into practice. The housing agencies need to be able to judge the housing schemes being put forward for funding to ensure that they are funding sustainable development. The sustainable development policies developed by the HAs reflect closely the sentiment of the 'Bruntland' (1987) definition of sustainability. Reference is made to social and economic sustainability yet the majority of indicators and measurement criteria are based on environmental sustainability. This imbalance suggests an obstacle exists to the delivery of sustainability through the procurement process.

The Housing Forum also sought to encourage partnering through the procurement process. Partnering is now central to the housing agencies' strategies for improving procurement of social housing. It has been suggested that the attributes of partnering are essential pre-conditions of achieving sustainable construction (Addis and Talbot 2001). It is evident that HAs and their consultants and contractors will have to reach a mutual consensus on the definition of sustainability at project level if it is to be achieved within the overall procurement process. There is a need to link the policy, regulation and guidance to the individual project circumstance. Such an investigation would allow surveying practitioners to formulate appropriate advice for clients



Sustainability in social housing has become a mainstream objective and funding criteria of the UK housing agencies

considering the commission of sustainable building projects.

1.2 Aims and objectives

This research set out to investigate sustainable project procurement practice and it was carried out within the context of the UK social housing sector.

Sustainability in social housing has become a mainstream objective and funding criteria of the UK housing agencies. There is a tendency within the housing agencies to refer to sustainability in both a finite and infinite sense. The Housing Forum defines sustainability as a goal or vision that forward looking organisations are working towards (Housing Forum 2004). The housing agency, Communities Scotland measures sustainability by the amount of CO2 produced and the number of brownfield sites utilised. This dubiety reinforces the difficulty experienced by those involved in social housing procurement.

An important aspect of delivery of construction project sustainability is the procurement system itself. Partnered procurement will form the basis of substantial change in the procurement of social housing and the housing agencies are encouraging it in the development of publicly funded social housing where appropriate. It has been casually linked to sustainability yet no research exists to establish if there are real benefits in terms of delivery. Long-term thinking and mutual goals, characteristics of partnering are also essential to sustainability. This research seeks to bring the concepts of partnering

and sustainability together and consider whether a collaborative or partnered approach to procurement is the key to delivering sustainability. Therefore the overall aims for the study were:

(a) to investigate the relationships and connections between the procurement system and the global environment
(b) to establish the features of sustainability that are relevant to the procurement of social housing projects.
(c) to develop a decision support tool or framework to integrate sustainability into the development of social housing.

The following section describes the main elements of the research design.

1.3 Research design

Investigation of a phenomenon provided the initial approach to the research. The research design was an iterative process developing as the literature review progressed. It became apparent that sustainability was an extremely broad and complex concept. The importance of treating the research topic in an holistic manner was evident from an early stage. The complexity of sustainability that was encountered in literature led to the consideration of systems thinking as a conceptual framework to assist in developing understanding in the subject. Soft systems thinking enables the researcher to develop a series of models that are tested in the real world in order to identify and put into place change that will improve the performance of a system.

It was thought that due to the complexity of the problem, the use of more than one research method would be beneficial and arguably essential to address the multi-faceted nature of sustainability. According to Punch (2000) quantitative and qualitative approaches can and should be combined where appropriate. As a result the research involved a mixed methodological approach.

The research unfolded in a series of research phases. In terms of data collection the following activities were undertaken:

(a) individual qualitative interviews were held to help shape the problem and develop a grounded - like conceptual theory.
(b) a project based case study was conducted that used a delphi approach to develop the understanding of what sustainability meant to a group of practitioners actually involved in a large scale social housing development programme.

1.4 Structure of the paper

Given the above it was resolved to structure this paper in the following manner, namely,

Section 2 investigates the relationships and connections between the procurement system and the global environment. A conceptual framework was developed by an iterative process between the literature review, an evaluation of the methodological approaches found in the construction management discipline and the approaches emerging in the field of sustainable development. The conceptual framework adopted for this research makes use of Soft Systems Methodology (Checkland 1978). This allowed the flexibility to explore the research area, while providing a conceptual framework to help understand the complexity found within sustainability.

Section 3 establishes the features of sustainability that are relevant to the procurement of social housing. This part of the study sought to provide understanding from the project stakeholder level up. An exploratory study was carried out to develop a profile of sustainability in the social housing sector. A Grounded Theory (Glaser and Strauss 1967) approach was used to develop a theoretical framework from a bottom up approach. Grounded theory is important in developing theory as it allows broad issues to be understood from the perspective of the individual expert practitioner involved in the process.

Section 4 develops a decision support tool or framework to integrate sustainability into the development of social housing. This section develops the Consensual Sustainability Model (ConSus) for establishing sustainability at project level. This final phase of research develops and tests a 'model' to make explicit the features of sustainability relevant to a particular set of stakeholders. The model is based on the Delphi method (Linstone and Turoff 2001). This method allows the combination of both qualitative and quantitative approaches and is considered a useful tool to incorporate rich qualitative data into a quantitative framework. This creates a holistic approach that allows the values associated with sustainability to emerge within the commercial environment of the procurement process.

Section 5 presents the conclusions of the research. The contribution of the research in the current research landscape is explored. Further work is suggested and the limitations of the study are presented.

2 Literature review

2.1 Introduction

This section develops the contextual background to the research. The broad areas addressed include sustainability and social housing procurement. The differing strands of literature are reviewed firstly to develop an understanding of the context of sustainable development from the macro global view to the micro project implementation level and then secondly to consider how sustainable approaches can be embedded in the procurement processes associated with social housing projects.

2.2 Sustainable development: the global perspective

The definition of sustainable development is a global issue that has captured the attention of world leaders through a vast programme led by the United Nations (UN). Although sustainable development is not purely about environmental issues, concern for the environment has been the driving force behind the global attention it is receiving. This programme is characterised by unanimous agreement at policy level and hampered by disagreement on putting policy into practice. This impact can be felt in the tension surrounding the implementation of the Kyoto agreement, aimed at reducing green house gas emissions. This agreement signed by one hundred and forty one nations was notably rejected by USA, by far the largest producer of carbon dioxide, on grounds that it may damage their economy (BBC 2005).

The agenda on sustainable development was first shaped by the World Commission on Environment and Development that was formed in 1983. Their work resulted in the publication of the 'Bruntland Report' after the chairwoman of the commission. Out of this work came a new definition of sustainability, that remains generally accepted to this day.

> *Sustainable development seeks to meet the needs and aspirations of the present without compromising the ability to meet those of the future* (Bruntland 1987)

This report became a catalyst for a widespread global reaction and the definition was endorsed by the UN five years later at the 1992 UN Earth Summit in Rio. This was an unprecedented gathering. 172 governments and 2,400 NGOs were represented (UN 1997). This summit resulted in the adoption of three major agreements: The Rio Declaration; the Statement of Forest Principles; and Agenda 21.

Agenda 21 agreed at the Earth summit in 1992, provides an obligation to all member states to develop a national sustainable development strategy and implement local strategies for the delivery of sustainable development at grass-roots level. Agenda 21 relates most closely to activity taking place at a national and local level and has had the most tangible impact of the three agreements. It sets out principles for wide-ranging action on sustainable development and the United Nations describes it as a comprehensive plan of action to be taken globally, nationally and locally by organizations of the United Nations System, Governments, and major groups in every area in which human impacts on the environment (UN 1992).

Agenda 21 incorporates development on a complex range of issues. Development is used to mean any human activity and Agenda 21 reflects the vast array of areas that this encompasses. It acknowledges that many of the problems and solutions addressed by Agenda 21 have their origins at local level. In response to this, an objective of Agenda 21 was for all local authorities to have a 'Local Agenda 21' by the year 1996, achieving consensus on what sustainable development means for the local community. There are certainly many examples of where there has been successful implementation of Local Agenda 21. A survey conducted in 1996 established that more than 1,800 local governments in 64 countries were involved in Local Agenda 21 activities (The International Council for Local Environmental Initiatives 1997).

The adoption of this agenda reflects global consensus and a political commitment to pursue the ideology of sustainable development. Following the Rio event in 1992 there was a significant activity towards establishing sustainable development policies. The UN established a commission on sustainable development the same year to oversee the implementation of Agenda 21. Rio+5 was held in 1997 to revisit and strengthen the commitment to Agenda 21. A new international development target was agreed, that all countries should have a sustainable development strategy by 2002 (SDC 2001).The meeting was a solemn reminder that little progress had been achieved and it was apparent that a lack of political will existed to implement the more difficult aspects of sustainable development, especially those that involved some sort of compromise (ENB 1997). In the same year the Kyoto protocol was signed by member states, committing them to the reduction of greenhouse gas emissions. The protocol finally came into force in 2005 and sets out a clean development mechanism (CDM) for targeted sectors. Construction is identified as one of the key target sectors.

2.2.1 UK sustainable development context

The UK government claim that they were one of the first nations to respond to Agenda 21. The first UK Sustainable Development Strategy (HMSO 1994) created the foundation for a decade's activity focused on the integration of sustainable development into the public sector. A better quality of life - a strategy for sustainable development in the United Kingdom (DETR 1999) identified four objectives, namely; social progress; protection of the environment; prudent use of natural resources; and economic growth and employment. Following publication of this document a set of fifteen headline sustainability indicators aimed at measuring performance was published. When evaluated under the headings of economic, social and environmental sustainability, there are three economic, five social and seven environmental indicators, illustrating the continuing bias to environment within the sustainable development policy.

Scotland meanwhile developed twenty four separate indicators, Wales twelve and Northern Ireland an alternative set, all designed to relate to specific priorities and circumstance (DTI 2004). These indicators have been used to report on progress annually and provide a 'barometer' of quality of life.

This range of sustainability indicators is supplemented by indicators developed by individual industries and sectors. The indicators are designed to measure the performance of the UK in terms of sustainable

Table 2.1: UK headline indicators of sustainable development

Economic	Social	Environmental
Economic output	Poverty and exclusion	Climate change
Investment	Education	Air quality
Employment	Health	Road traffic
	Housing	River water quality
	Crime	Wildlife
		Land use
		Waste

development. Seventy of the one hundred and fifty national sustainable development indicators can be linked to housing and community issues (Housing Corporation). This places housing centrally in the movement to improve sustainability in the built environment. This confirms the importance placed on housing in the UN Agenda 21.

2.2.2 Response by the research community

The research community has simultaneously grasped the need to develop understanding of sustainable development practices and processes. Construction research related to sustainability has risen exponentially since the 1970s.

The research carried out earlier in the period studied had a strong environmental bias. A large amount of the research was focused on technical solutions and seems to correspond to the increase in 'environmental design' apparent in the 1970s. Researchers were active in developing the use of low technology materials; solar design; low energy solutions (Besant et al. 1978; Urbanek 1978). Latterly research labelled under the banner of sustainable development has become more centrally focused on the broad issues of sustainability – economic, social and environmental sustainability (Hill and Bowen 1997; Bakens 1997). Research approaches have changed concurrently with the shift in thinking on the meaning of sustainability. The new definition has given a confidence to researchers to address much broader issues on sustainability. Kibert et al. (2000) refers to

a worldwide change in emphasis experienced since the beginning of the 1990s. Organisations have been referring to sustainable construction and considering the whole life cycle of buildings in terms of the global sustainable development movement.

In 1997 Hill and Bowen published Sustainable Construction: principles and a framework for attainment. This was the first research to seriously address the triple bottom line model of sustainability in the construction sector. They proposed a four pillar approach which divides environmental sustainability into technical and biophysical sustainability. The approach suggested is supported by a detailed framework for attaining sustainability through a construction project. The proposal relies on the existence or creation of an Environmental Management System (EMS).

The special issue on sustainability in the built environment published in , Building Research & Information recognised non-technical or 'soft' issues as being 'at least as crucial for a sustainable development in construction [as technical issues]' (Sjöström and Bakens 1998). Du Plessis (1998) is deeply critical of the way in which sustainability is developed without due regard to the social impact it has. She argues that sustainable development is in danger of becoming just more politically correct jargon (Du Plessis 1998: 388). Brandon (1999) agreed that an approach is needed that differs from the reductionist thinking associated with traditional measurement tools.

Since 1998 there has been a steady stream of research that challenges the construction industry on its approach to sustainable construction. The Green Building Challenge was an international study of assessment methods used in twenty countries. It sought to bring together best practice in the measurement and assessment of sustainability. The research was a partial success and advanced thinking in the area of life cycle assessment (Larsson and Cole 2001). Subjectivity in measurement was cited as a barrier to successfully comparing the performance of one project against another. Controversially, Cole (2001) suggests that a shift to a holistic approach towards sustainability may not be possible before adequate measurement tools or toolkits are in place.

2.2.3 Indicators of sustainability: policy and toolkits

How is sustainability measured? How can we know what the objectives are? How is it possible to know if there is progress being made? Bell and Morse (1999) describe these questions as a conundrum. They argue that sustainability has much in common with truth and justice, based as it is on value judgements and ethics, but it must be put into practice by imperfect human beings. If sustainability is to be treated as a goal or objective, then a suitable measure must be adopted to establish if the goal has been reached.

A vast, and potentially confusing, array of initiatives on environmental and sustainability indicators are under-way inside international governmental organisations, such as the UN, European Union, OECD and World Health Organisation (Cox et al. 2002)

Analysis of policy documents and some of the more commonly available toolkits that are used by the social housing sector reveals some of the inconsistencies that exist between policy and practice. The headline

indicators adopted by the UK government have been used to frame an analysis of the sustainable development policy documents for the construction sector and the social housing sector, and the toolkits used by practitioners involved in procurement of social housing projects (Figure 2.1).

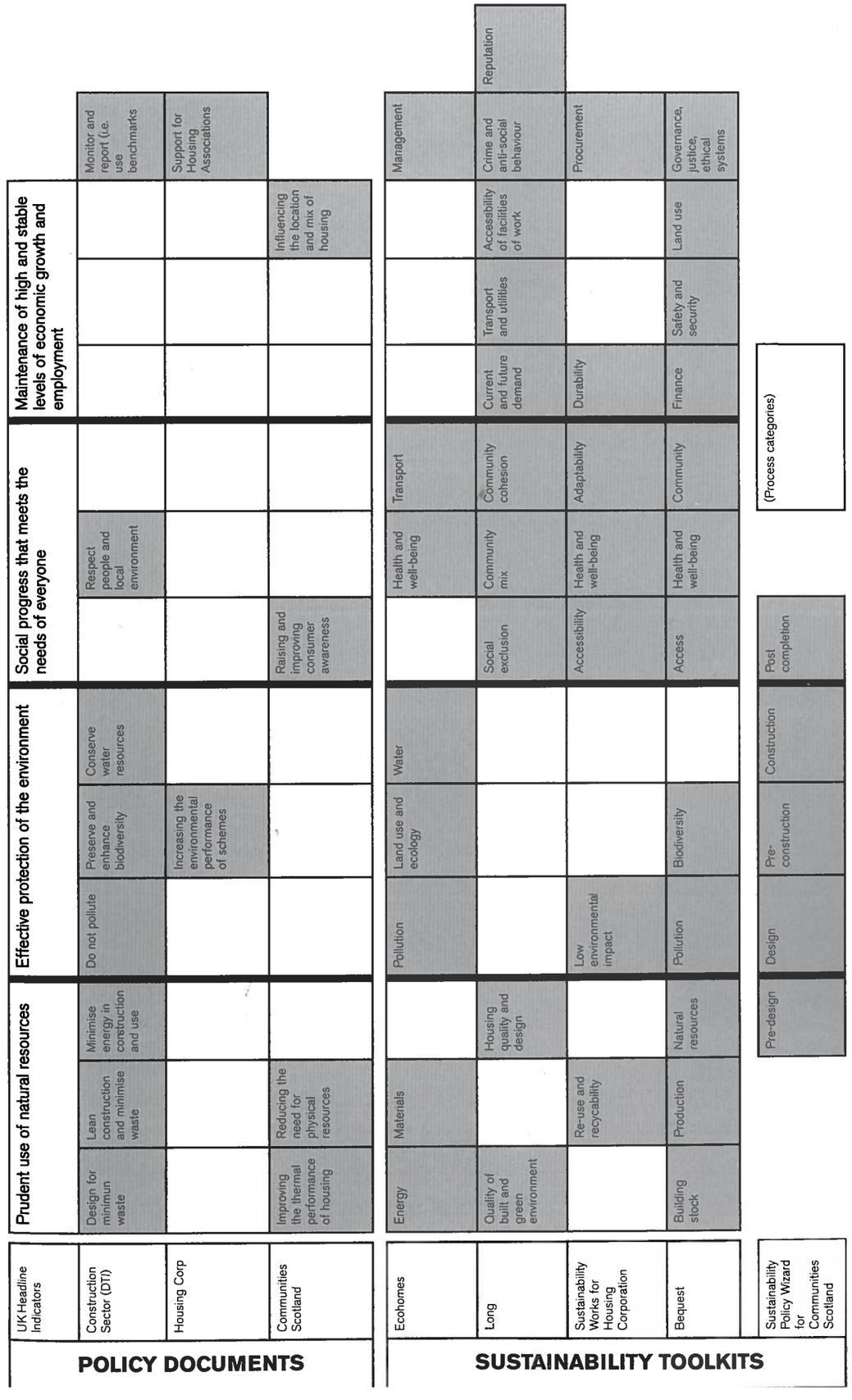
Policy Documents and Toolkits: The construction sector sustainable development policy (DTI 2004) sets out eight areas for

Analysis of policy documents and some of the more commonly available toolkits that are used by the social housing sector reveals some of the inconsistencies that exist between policy and practice.

attainment of sustainability. The housing agencies in England (Housing Corporation) and Scotland (Communities Scotland) identify three and four areas (respectively) for sustainable development. The emphasis of these policy documents is on environment and resource efficiency. The social and economic aspects of sustainability are given little prominence. This is not clearly reflected in the toolkits (Ecohomes; Long; Sustainability Works; Bequest; Sustainability Policy Wizard) that have been developed for use by the social housing sector. Analysis of these toolkits shows that while the Ecohomes model has an environmental bias, the others are weighted towards social and economic factors. The exception is the Sustainability Policy Wizard which uses process categories, rather than the usual subdivisions of environment, social and economic.

BREEAM and ECOHOMES: BRE (Building Research Establishment) launched its environmental assessment tool during 1990. BREEAM (BRE's Environmental Assessment Method) is used to assess the environmental impact of buildings. The application has been developed specifically for housing under the name of Ecohomes. The assessment method aims to balance environmental performance with quality of life indicators. The issues assessed are grouped into seven categories: energy; water; pollution; materials; transport; ecology and land use; health and well-being. Following a formal assessment a building is rated on a scale of Pass, Good, Very Good or Excellent. The Housing Corporation is phasing in use of Ecohomes rating for all new social housing developments. By April 2006 all new development must achieve at least a 'Good' Ecohomes rating (Housing Corporation 2005a). The assessment has been well received but it focuses heavily on environmental issues and the output, in the form of a total score, is capable of masking parts of the development that are not sustainable.

Figure 2 1: Sustainability Policy and Toolkit Comparison



BEQUEST toolkit: The BEQUEST toolkit was produced by a pan-European network with EU funding. It was founded on the premise that knowledge would grow by sharing advice and experience on how to make development projects more sustainable. A decision support system for making informed decisions on urban development was integrated with the system to address sustainability in a holistic manner. The BEQUEST toolkit hoped to bridge the various scales of urban development from whole urban regions down to buildings and their components and materials (Hamilton et al. 2002). The system was developed as prototype, but at the time of writing, this toolkit appears to be non-operational.

A toolkit of indicators of sustainable communities (Long 2003): This set of indicators is now mandatory for all housing associations in England. (Long 2003). The toolkit is defined by nine indicators (Figure 2-2). These are aimed at the wider context of community and the core factors of demand, reputation and crime reflect their broader application. Housing quality is built into this set of indicators but not sufficiently to be useful for application in the procurement process. The indicators of current and future demand for the housing are vital considerations to sustainability but relate to strategic decision making.

Sustainability works: This resource, developed to support housing associations increase the sustainability of their developments, provides information on how to increase sustainability within a project. Sustainability Works makes use of web based technology and provides interactive tools for writing reports to fit in with the use of Ecohomes and various other initiatives used in the English social housing sector. The guidance is well presented and covers a broad range of issues - Adaptability; Durability;

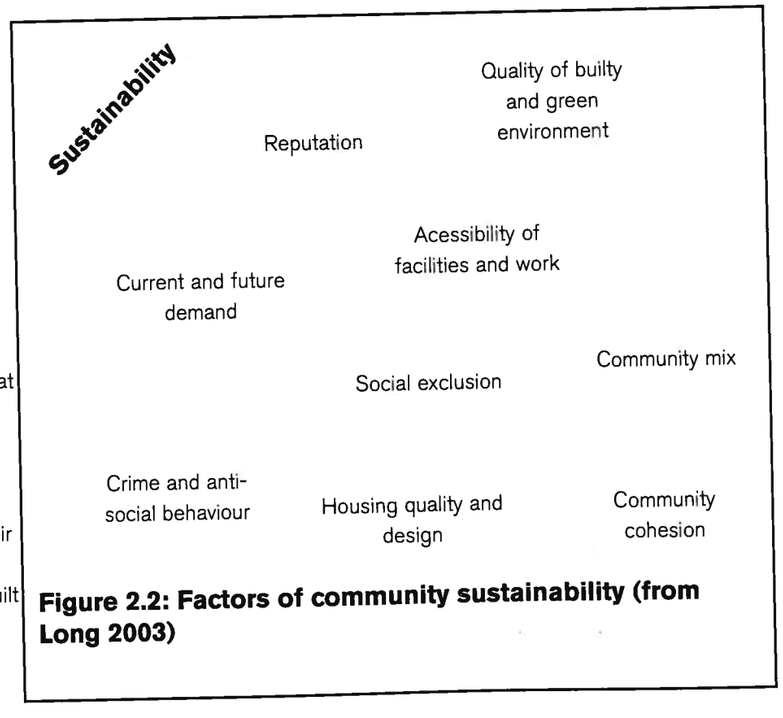


Figure 2.2: Factors of community sustainability (from Long 2003)

Accessibility; Low Environmental impact; Re-use and recyclability; Health and wellbeing; Procurement; Asset Management. The disadvantage of this resource is that it does not provide a specific framework for decision making. The large number of issues is liable to overwhelm a user or lead to a checklist mentality.

Code for Sustainable Homes: The new 'Code for Sustainable Homes' came into existence in 2006. It is an approach designed to measure a broader definition of sustainability than is achieved with EcoHomes. The categories allow the rating of a home up to the aspirational rating of a 'Zero Carbon Home', which improves on the excellent rating achieveable through EcoHomes. The new code replaces the EcoHomes rating from April 2007 in England. Although it does not impact the findings of this research, it is set to become a significant influence on the definition on sustainability for housing (DCLG 2007).

The toolkits set out above are the main measurement tools currently available. Each has its merits, but they do not address the specific needs of an individual project. There is a need for a change in the way in which sustainability is evaluated for construction projects. A suitable framework which enables decision makers to understand the implications of sustainability is needed (Lombardi and Brandon 2002).

2.2.4 Summary of sustainable development

Reviewing the literature, it is evident that the UK government is committed to the concept of sustainability and is involved in developing and evolving the strategy and policies that are key to shaping action on sustainable development. There is high level commitment to and integration of International policy on sustainable development.

The range of principles, toolkits, definitions and agendas relating to sustainability is overwhelming. The common theme of equiponderance towards economic, social and environmental aspects of sustainability manifests itself in many of them. The common failing of all the toolkits considered, is that they either are too broad – aimed at policy level thinking; or overly complex – detailing vast lists of actions appropriate to improving sustainability. The result is a lack of a structured framework or decision support tool to assist project teams involved in the procurement of a building project.

2.3 Procurement of social housing

The UK government has provided increased public funding to procure social housing and it has implemented a high profile campaign to improve the sustainability of housing. This is evidenced by the following extract from a policy statement, namely,

> *The Government is putting in the resources to make all social homes decent by 2010. Our sustained investment in social housing will have enabled local authorities and housing associations to spend around £42 billion on their existing stock by 2010.*
> (ODPM 2005: 9)

Housing is central to the successful delivery of sustainability. It affects quality of life and has implications beyond housing, affecting transport, health, employment and community (Stevenson and Williams 2000). The requirement to deliver sustainable

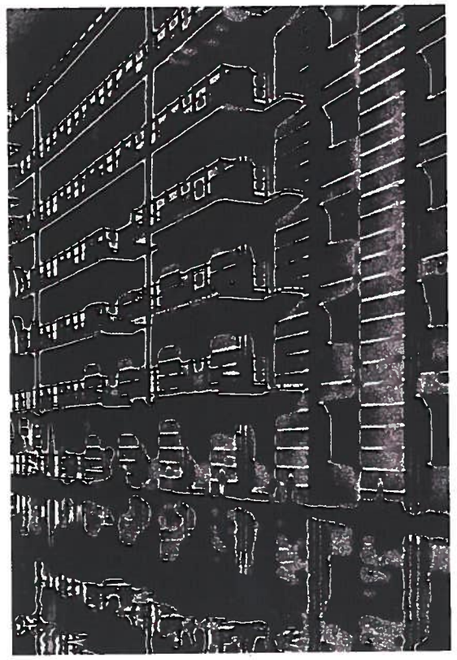
development is met with a challenge to those agencies and other stakeholders involved in the procurement of social housing. There has been significant impact on social housing since the publication of Rethinking Construction (Egan 1998). This report identified opportunities to improve the efficiency and quality of delivery of UK construction. One of the major themes that emerged from the Rethinking Construction agenda was the need for the construction to be more sustainable in its processes and its output. The Housing Forum,created the same year had the objective of implementing the Egan principles in the housing sector. Social housing was targeted as an area best able to deliver improvement in respect of the efficiency gains. The approach to procurement used at the time was perceived to lower the quality of the housing and major change was needed.

Procurement in the context of development refers to the approach used by a group of stakeholders to plan, design and construct a housing project. It can be described as the mechanisms used to realise a project (National Housing Federation 2001). Housing Associations can be seen to use a variety of procurement options to produce housing. Traditional and Design and Build are the most common forms of social housing procurement across the UK. The introduction of the "best value" principles with the 1988 Housing Act saw an increase in the use of Design and Build (Griffiths 1999). And more recently a partnered approach to procurement is actively being promoted from the housing agencies through funding controls.

Traditional contracting was the main form of procurement used throughout the housing association sector for the majority of the 20th century and still is the predominant approach. Because of the separation of the design and construction processes in traditional contracting, the contractor is not involved until the design and construction drawings are produced. This limits input by the contractor, and removes incentive to make cost savings or innovate in the construction process. The housing association retains control over the design of the housing and can achieve cost certainty on the agreed scheme, but bears the risk of cost overruns from any changes or unforeseen circumstance. Until 1988 housing associations were cushioned by the existence of deficit funding. This provided additional grant funding for schemes that had exceeded their original cost estimates (King 2001). This reduced the need to pass on risk to the contractor. The contractor is selected by competitive tender.

Design and Build involves some or all of the design being undertaken by the contractor. This form of contracting is often adopted to deliver projects earlier than might be the case with traditional contracting. The housing association benefits from cost certainty on a project, but loses control over the design beyond setting initial client requirements. This approach emerged for housing associations in the 1980s. Two thirds of new build schemes were procured by design and build by the mid 1990s in England and this form of procurement has become increasingly popular in Scotland. Design and build became especially significant with the removal of deficit funding in the 1988 Housing Act. The element of cost certainty seems to have attracted more housing associations to its use in procurement of new housing.

Goodchild and Beatty (2000) examined the procurement practices of Scottish housing associations. A study of procurement methods carried out between 1993 and 1997 revealed that 57% of all new bedspaces were procured using traditional contracting, while 37% employed design and build. The remaining 6% were purchased as complete buildings. The emphasis on traditional contracting may be explained by specific endorsement of this approach in the Procurement and Practice Guide (Scottish Homes 1990).

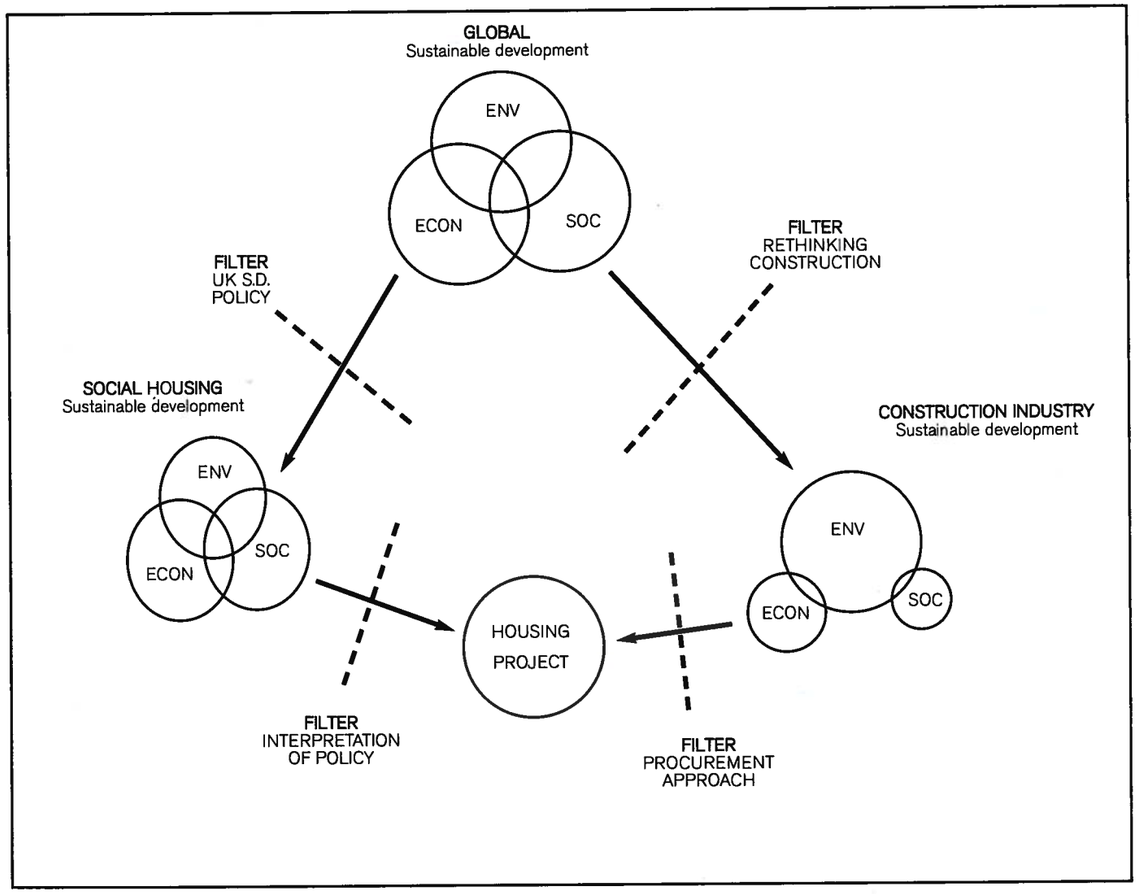


Partnering was identified within Rethinking Construction (Egan 1998) as a means to deliver efficiency gains through the procurement process. The housing agencies in Scotland and England have integrated partnering into their development programmes. Building a Better Deal (Communities Scotland 2002) recommends that partnering is considered for all medium or large capital works. Housing associations in England have been able to apply for development funding through a 'partnered approach' since 2004. There are no up to date figures on the number of projects being procured through a partnering arrangement. Anecdotal evidence suggest that there is an increase in the use of partnering across the social housing sector. Demonstration projects illustrate the successes of using partnering (Housing Forum 2004) and there is a belief that partnering can bring efficiencies especially when using innovative forms of construction (Garrand 2001).

2.4 Summary

The literature reviewed in the areas of sustainable development and social housing procurement have provided the contextual background for this study. The most significant findings are concerned with the interaction found between the separate topics. Figure 2.2 represents the relationships that exist between global sustainability and the procurement of a housing project in the social sector. The relationships are all affected by filters that have an impact on the way in which the relationship manifests itself. The understanding of sustainable development in the social housing sector is filtered through the UK interpretation. The construction industry has been guided through the principles set out in Rethinking Construction (Egan 1998). As part of this agenda,

Figure 2.3: Map of literature following review

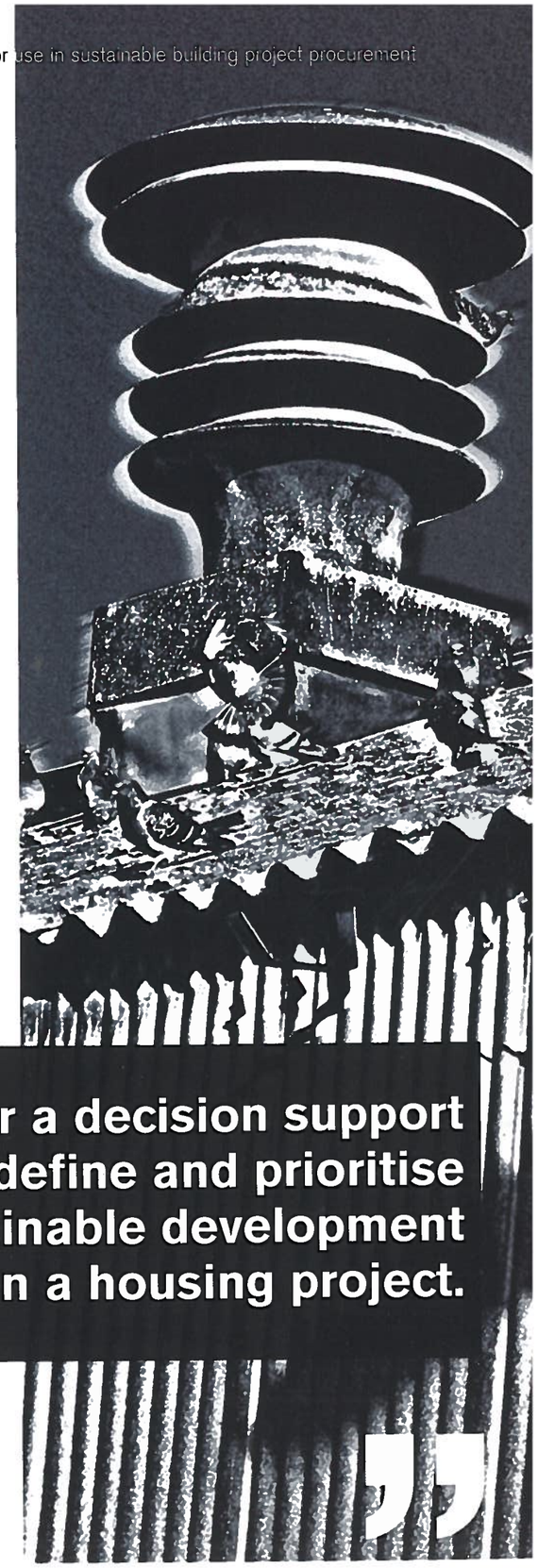


sustainable development has emerged as a major issue for the construction industry. This has resulted in a comprehension of sustainable development that differs significantly to the social housing sector. The way in which sustainable development is realised in a housing project is subject to the 'filters' of procurement approach and the way in which the sustainable development policy has been interpreted.

Sustainable development has evolved from an environmental bias to a much broader definition that incorporates social and economic aspects. The construction industry has developed an environmental bias to its understanding of sustainability. This position has an effect on the way in which sustainability is delivered in a project.

A wide range of sustainability toolkits and indicators are available. ECOHOMES ® is being used in the social housing sector for assessing the environmental impact of new

housing development. The range of support, resources and policy advice the housing associations receive on sustainable development is vast. Yet there is not a clear definition of sustainable development at project procurement level. There is a need for a decision support framework to define and prioritise what sustainable development means in a housing project. Without this, policy and practice remain on separate levels and real progress will be difficult to achieve.



“There is a need for a decision support framework to define and prioritise what sustainable development means in a housing project.”

3 An emergent model of sustainable procurement

3.1 Introduction

The research problem that emerged out of the literature reviewed in section 2 indicated that there was a need to establish meaning at project level for the concept of sustainability. It was shown that the interpretation of policy was a filter to the way in which sustainability was defined for a building project. The first part of this section presents a justification of the choice of methodological approach and its application to the research problem. The second part of this section presents work that was conducted within the social housing sector. The research consisted of two waves of interviews that collected data on policy and frameworks. Each of these phases is presented in terms of the data collection, subsequent analysis and the development of a propositional model. A grounded-like theory of sustainability procurement is constructed that can be used by practice to help deliver sustainable housing schemes for Hosing Association clients.

3.2 Justification of research approach

The concept of sustainability and its delivery at project level is founded in a quickly evolving environment, with constantly changing legislation, guidance and policy affecting procurement. A recurrent theme is lack of understanding at implementation level (CRISP 2001, Cox et al. 2002). This results in a difficulty in translating policy into meaningful practice.

A qualitative research approach is considered best when attempting to elicit meaning from a situation. Qualitative data focuses on naturally occurring, ordinary events in natural settings and provides a good understanding of real life situations (Miles and Huberman 1994). It is argued that qualitative data is rich and holistic and is useful in revealing complexity and meanings, people place on the social world around them. This research makes use of a grounded theory (GT) approach as this involves a 'rigorous, systemic procedure' which inductively derives a theory from the phenomenon it represents (Dainty et al. 2000).

A grounded theory is inductively derived from the study of a phenomenon, which is inadequately explained by existing theory (Strauss and Corbin 1990). It is particularly suited to the study of local interactions and meanings and their relationship to the social context in which they occur. Rather than testing relationships among variables, it involves discovery of relevant categories and the relationship between them. Concepts are the basic unit of analysis in grounded theory (Strauss and Corbin 1990). Discovery of concepts marks the difference between basic description and the development of theory. In GT method the process of conceptualisation results in the labelling of concepts which are brought together in categories. This is called 'open coding'. In the process of coding each category can be given properties and dimension. Properties are the characteristics or attributes of a category and add to the understanding of that category contextually.

Axial coding involves making connections between categories. The coded categories may be developed and linked to other categories using a paradigm model presented in Strauss and Corbin (1990). GT is an iterative process. The researcher moves between collection of data and analysis in a cycle that may be repeated as often as is

required to reach theoretical saturation. This occurs when the data no longer generates new theoretical elements but confirms patterns and relationships that have already been found. GT was therefore used to analyse data collected in this study. This data collection process involved two rounds of interviews and an analysis of frameworks and policy documents and it allowed a grounded-like model of sustainable procurement practice to be generated.

3.2.1 Data collection and analysis process

Qualitative data were collected from two sources: interviews; and policy and framework documents. This "data" provided the material for generating a set of propositional models of sustainability in the procurement of social housing.

Interviews: Punch (1998) states that interviews are a good way of accessing people's perceptions and constructions of reality. The aim of the interviews was to establish the meanings and values associated with the term sustainability and further explore the ways in which it was being applied at the project level. The interviews for the study were conducted with a minimal structure, in order to maximise the richness of the data. An interview framework was prepared to guide the conversation. The interviews lasted about an hour in length and were planned to allow the interviewee the freedom to express their ideas and feelings on their housing association's position within the sustainable development policy framework. Each interview was audio-taped and then transcribed verbatim. The first round of interviews was conducted with the development managers of housing associations. To achieve a balance it was considered useful to interview other participants involved in the procurement process. Therefore, a second round of interviews was held with consultants selected from a range of housing associations (3), professional consultants (3) and a representative from the Scottish housing agency (1).

Policy and Framework Documents: Section 2 indicated the considerable activity in the development of frameworks for the

implementation of sustainability in the procurement of construction projects.. Sustainable development policies and theoretical frameworks are intended to guide construction activity to attain the goal of sustainability. One of the aims of the research was to establish the features of sustainability that are apparent at practice and policy level. A grounded theory approach to the literature

was designed to provide a theoretical understanding of sustainability from a policy perspective. Publications with a relevance to or impact on the social housing sector were selected and subsequently analysed to develop a propositional model. This process was aimed at developing a picture of the main issues that are emerging from policy level.

Data analysis - Analytical Framework: The central premise of grounded theory is to generate theory out of data by a process of conceptualisation. To this end the paradigm model (Figure 3.1) proposed by Strauss and Corbin (1990) was used as the analytical framework for the research. This approach aims to unravel the complexity found in the concept of sustainability at project level.

The paradigm model (Fig 3.1) is used to develop a set of relationships that exist for each of the main categories that emerged out of the data. This analytical process establishes the causal conditions and context of a main category or phenomenon and the intervening conditions, action/interaction strategies and consequences associated with it.

The Coding of Data: The data collected during the interviews were analysed using NUD*IST qualitative software. The software enables the results of analysis to be arranged in a hierarchical tree structure. The central phenomena relating to sustainability form the root/s of the tree and sub categories or nodes are generated. The initial analysis involved open coding the data. Three hundred and fifty three individual nodes were identified. Axial coding then revealed relationships between nodes and sub nodes. This process revealed main features of sustainability and the vast array of sub issues that relate to each area. As the analysis continued each category was developed to reflect the content of the conversations and draw out more detailed categories within each of the main categories. In developing this process the conversations were analysed repeatedly. A 'Propositional model' was developed from the analysis of the first round of interviews. This illustrates the main features of sustainability emerging from the grounded theory process. Following the analysis of the second round of interviews, an 'Emergent model' of sustainable procurement was developed. The second model acted in two ways. Primarily it sought to add breadth to the model by widening the perspective of views captured. Secondly it sought to confirm the relevance of the features emerging out of the first model.

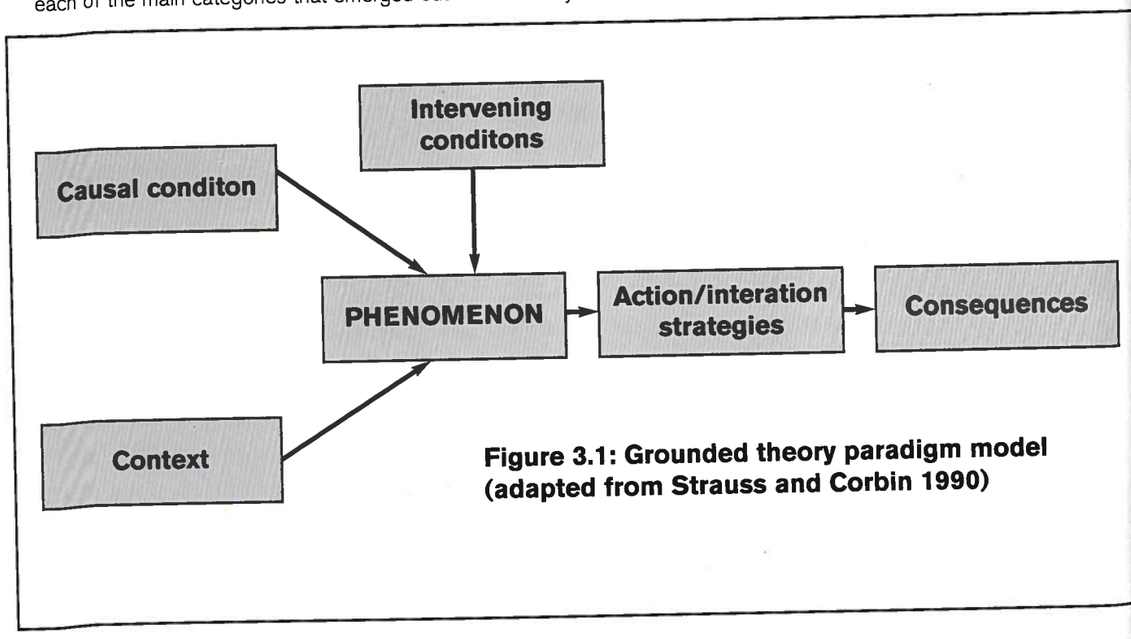


Figure 3.1: Grounded theory paradigm model (adapted from Strauss and Corbin 1990)

3.3 A propositional model of sustainable procurement

3.3.1 Housing association interviewees

Interviews were undertaken with three housing association development managers. The housing associations were selected to represent small, medium and large sized registered social landlords. The aim of choosing the three different types of organisation was to explore similarities and differences between the understanding of sustainability and the way in which the organisations attempted to deliver it through the procurement system. The interviews were all conducted within the offices of each housing association.

3.3.2 Propositional features of sustainability

The open coding process involved extensive analysis of the conversations. Thirteen phenomenon or features emerged from the data. Each of these features together with typical examples of relevant data is considered separately in the following section to demonstrate the way in which it emerged.

Feature 1: Building standards. Building standards is a key issue with the housing associations. Various constraints appear to frustrate the ability of housing associations to provide the quality of completed product that they aspire to. Several main issues dominated this feature of sustainability - quality of the housing; national standards; contractor culture; and location of property. The following were typical of the comments of the interviewees relating to this emergent feature,

"We try to improve quality, lessen waste and bring innovation through...site specific innovations are the only thing we really do"....(Int 1)

"We specify Nordan windows....more expensive, but better value for money.....they kept trying to get us to go for other ones"(Int 1)

"All double glazed, high performance windows, good insulation. We've got a very high satisfaction"(Int 2)

"The aspiration of a single person is to have more than one bedroom...."(Int 3)

Feature 2: Community facilities. The notion of community was certainly an underlying issue to the housing associations, although it did not dominate any of the discussions. Social cohesion and community were clearly important features of the HAs remit, but

perhaps a bi-product of the procurement rather than a central focus. This is evidenced in the following comments,

"The community centre has been upgraded. That has really helped the area" (Int 1)

"We did build a hundred units and that has a community centre but it's not well used. I think it needs a bar or something" (Int 2)

"....have suggested that we take on estate management for the whole of [local area], including things like street lighting. Who's going to pay for this? (Int 1)

"....looks at direct service provision...area based strategies are undertaken" (Int 3)

Feature 3: Energy efficiency. Energy efficiency was expected to come out very strongly in the conversations because of the dominance of energy efficiency in research relating to sustainable development. The topic seemed to be well bedded within the remit of what the housing associations were doing in terms of development, yet specific mention of energy efficiency was most strongly aligned with fuel poverty (Feature 5). Typical of the comments made were,

"That's what got us interested, it was energy efficiency projects" (Int 2)

"When we're putting in ordinary heating, district heating and CHP. You look at the capital cost and pay back costs. You know the benefits to the environment" (Int 2)

"We decided to go with white meter. Where we put it in small flats it wasn't an issue. ....but they're heating has been a disaster in the refurbished flats" (Int 1)

Feature 4: Feedback. Tenant feedback was clearly a predominant issue with all of the HAs. It appeared to be an integral part of the procurement cycle and was used to establish improvements for later phases of development or future projects. Typical of comments made were,

"Four to six weeks after moving in we ask them about quality" (Int 1)

"At the end of the defects period we ask them again what they thought" (Int 1)

"There's tenant focus groups.....we do things like tenant satisfaction surveys" (Int 2)

The tendency to get more feedback when projects have failings can have serious impact on associations and the way in which their development work is operated.

"And politics play a part in it as well. Particularly the bad bits..It's a minefield" (Int 3)

Feature 5: Fuel poverty. Eradicating fuel poverty is one of the key drivers of the housing agencies. The UK government has committed to reducing households living in fuel poverty and the housing agencies have made it one of their key goals. 'Fuel poverty' occurs when a household's heating costs are unaffordable. It appears to be a central

concern of the housing associations. Comments made included,

"We had this issue about whether we're saving the planet or are we saving someone's fuel bills" (Int 2)

"..it was energy efficient projects, which I suppose was because of fuel poverty. So I suppose that is where we came from" (Int 2)

Feature 6: Funding. The housing associations were aware of the impact funding decisions had on their ability to provide innovative solutions within their housing projects. Comments made included:

"...it's bottom line all the time, everytime. They're shocking. And I've had huge arguments with them [discussing one of the large councils]" (Int 3)

"But we were beaten down on cost and they'll have to come out." (Int 2)

"...but competition is hopeless. It drives everything down to the lowest common denominator" (Int 3)

Feature 7: Insulation. Insulation was not mentioned frequently in any of the interviews specifically. There was indirect reference to insulation with regard to improving thermal performance of the housing and increasing the efficiency of heating systems. This does not necessarily reduce the importance of this feature of sustainability. It perhaps implies the implicit nature of insulation to the concept of sustainability in the procurement process. However some comments were made as follows:

"...cant afford to pay high heating costs. You need good insulation" (Int 1)

"They have their problems as well in terms of insulation" (Int 3)

"all double glazed, high performance windows, good insulation" (Int 2)

Feature 8: Involving tenants. Tenant involvement in the procurement process is an important feature to all the interviewed housing associations. All three associations made statements of the intrinsic nature of involving tenants in the procurement process. Comments made in relation to this feature included:

"Regeneration schemes, new build, rehab. Then obviously we have to engage directly with the people" (Int 3)

"two or three weeks after moving in they have an evening, just to let them know who lives in the stair...." (Int 2)

Feature 9: Maintenance. H.A.s generally have a long term interest in the property. Maintenance issues are usually considered within the procurement of social housing as an important decision aid. Some comments that were made included the following:

"we have a guy with a phone with a staff at 24 hours. All sorts of, so we do provide an incredibly good service" (Int 2)

"The only thing we are really doing is we started putting in the design brief that things should be maintenance free. I don't know if that's sustainability, but for us it's the long term life of things". (Int 1)

Feature 10: Mixed developments
Incorporation of amenities within a community was viewed as important to the overall success of an area. Lack of amenity is thought to be a contributing factor to unsustainable communities. This is borne out by the following comments:

"...its not just new housing. The community centre has been upgraded...so that will bring another change to the area"(Int 1)

"The local shopping is better, not great, but a lot better than it was"(Int 1)

"We like the idea of having workspaces...but people on low income...their employer doesn't tend to let them do it [work at home]. There's no need for it"(Int 2)

Feature 11: Mixed tenure Providing a mix of housing types has been part of housing policy for a number of years. It has been strongly associated with the social sustainability of a community. Comments made in relation to this feature included:

"Looking at the waiting list and ....forty percent people wanting a three bed house, fifty percent wanting one bedroom"(Int 2)

"It was based on waiting lists.....take what you get given at face value then you are on a hiding to nothing. So we took a view and the council co-operated.....so theres a lot less flats and more houses. It costs, you know."(Int 3)

Feature 12: Quality of specification
Specification of housing has a major influence on sustainability. The materials, innovation in design, energy efficiency of systems and components and the involvement of tenants in its development are all integral features of the specification. The significance of this feature is illustrated by the following comments,

"We're not prepared to look at non traditional build forms in new build, as they did there. They have their problems as well in terms of insulation, but hey, that was an answer then"(Int 3)

"Generally far higher standards of energy efficiency and the quality of the product [talking about standard house types]"(Int 3)

"The architect sat with each tenant and discussed the needs of the tenant...very low turnover because the tenants had a good say in the design of the houses"(Int 1)

Feature 13: Rent levels Acknowledgement was made that social housing tenants could not afford high rents. However, they were able to get assistance from housing benefit to supplement or pay their rent in full, depending on their circumstance. Housing benefit is paid to the majority of social housing tenants. However, there remains a percentage of tenants that are financially burdened by the level of their rent. This is evidenced in the following comments:

"the more services we provide, the higher the rents"(Int 1)

"You know your tenants are on the whole quite poor, they can't afford to pay high costs"(Int 1)

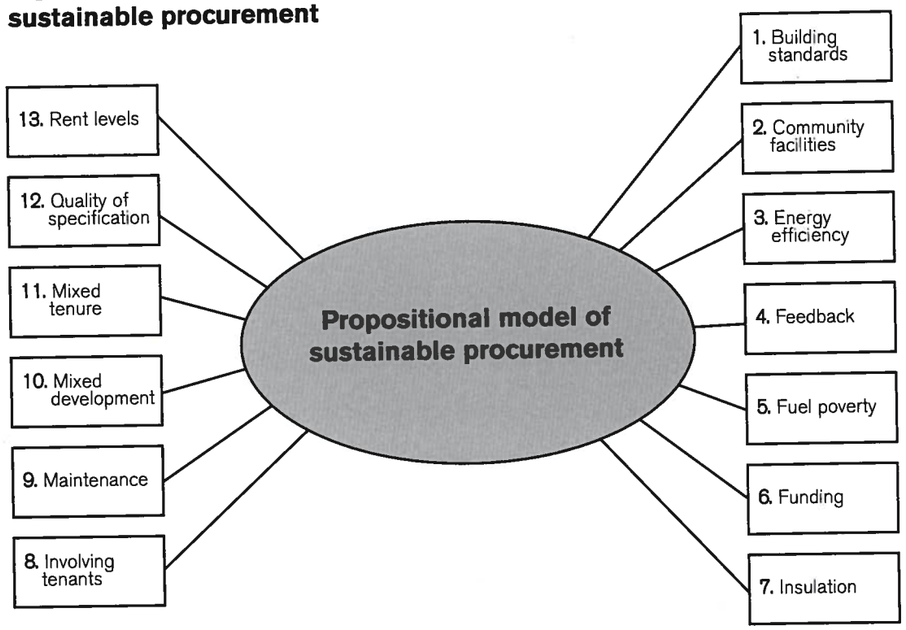
"If the rent was high, they could get plenty of help on a sliding scale, but if they were unfortunate"(Int 2)

3.3.3 Propositional model 1
To gain a better understanding of the perception of sustainability for the social housing sector the analysis identified the aspects of sustainability that were highlighted as being important to the procurement process. Figure 3.2 represents the aspects of sustainability that emerged from the conversations.

"....there remains a percentage of tenants that are financially burdened by the level of their rent."

The propositional model provided the analytical framework for the second round of interviews. This second round of data collection was intended to increase the theoretical sensitivity of the findings (Glaser 2001). This second round of data collection aimed at deepening the understanding within each of the features so far identified and confirming the concepts and their characteristic features that have emerged for their relevance.

Figure 3.2 Propositional model 1 - features of sustainable procurement



3.4 An emergent model of sustainable procurement

3.4.1 Project stakeholder interviews

The second round of data collection involved interviews with other stakeholders involved in the process of delivering sustainable procurement practises. The interviewees were two architects and a sustainable development director with the Scottish housing agency, Communities Scotland. Both architects worked in private practice, fulfilling the role of designer and project manager for housing association clients. In both cases, the architects had worked with several housing associations repeatedly, building up a strong relationship with these organisations.

The representative of the housing agency was centrally based and was instrumental in the development of the 'Sustainable Development Policy' (Communities Scotland 2003) for the Scottish social housing sector. The interview provided a policy perspective on sustainability that provided some contextual background to the emerging grounded theory.

3.4.2 Emergent features of sustainable procurement model

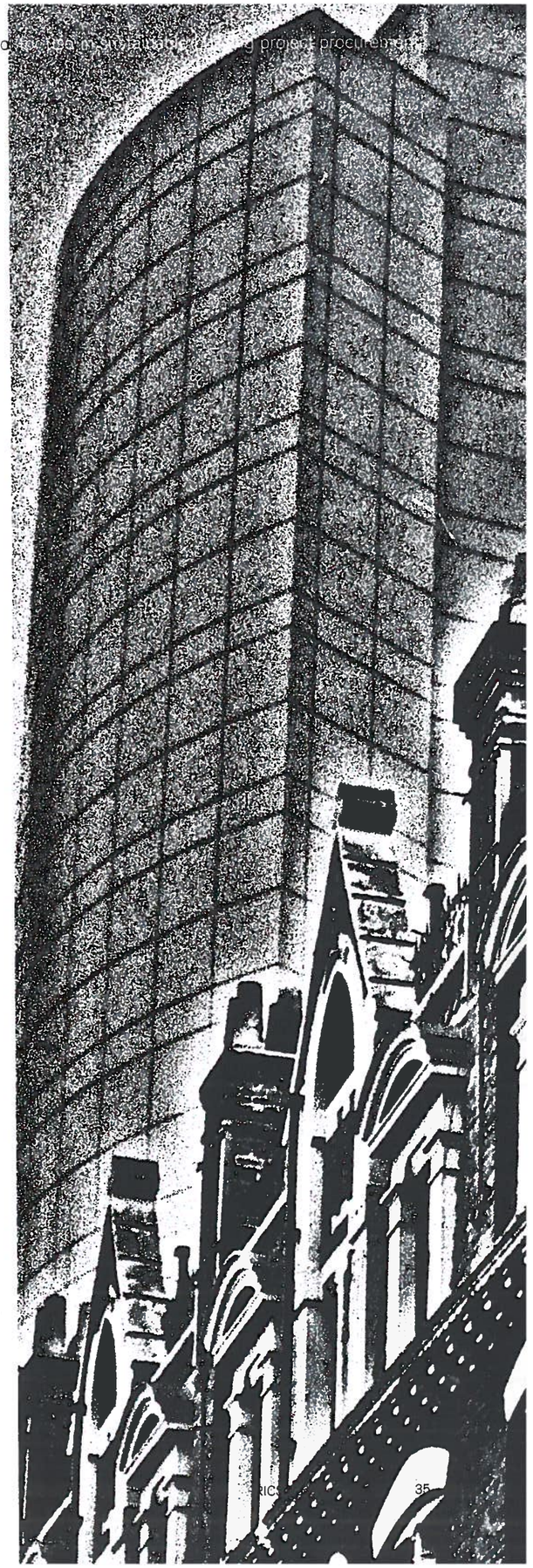
The thirteen features of sustainability that comprised propositional model 1 of sustainability features developed from the first round of interviews form the basis of the emergent model of sustainability. This model is developed following the analysis of the data from the second round of interviews. The interviews were analysed based on the coding framework from the propositional model. This iterative process produces features grounded in practice rather than theory. Analysis of the conversations sought to confirm the main features of sustainability and explore any additional emerging features. The following sections presents the results of that data analysis which identified practice based features of sustainability. Typical comments drawn from the interviews that were conducted in this round of data collection have been omitted from this section of the report to avoid repetition. Copies of the data can be obtained from the researchers direct. The features and sub- categories identified by the analysis are tabulated below in Table 3.1 and illustrated in Fig. 3.3

The emergent model of sustainable procurement comprises the fourteen main features of sustainability uncovered above – see (Figure 3.2). The model confirms the features generated through the conversations with the housing associations and strengthens their relevance to the procurement system. Each feature is populated by a range of sub-categories pertaining to the main category. The features developed as a result of repeated open and axial coding of the data. The features are arranged in a hierarchical arrangement which helps to understand the dominance of some features.

Recycling (feature 14) emerged as a new feature of sustainability from the conversations with the consultants. This feature, not the most dominant for the consultants, represents a recent technical development in the procurement system. It had not registered as important with the housing associations but it is clearly recognised for its role in the procurement system by the consultants and it is likely that housing associations will become more aware if its relevance in the future.

Table 3.1: Sustainability features and sub-categories from second round of data collection

Main feature	Sub-categories
1. Building standards	1.1 Quality of housing, 1.2 National standards, 1.3 Contractor culture, 1.4 Location of property
2. Community facilities	2.1 Community centre, 2.2 Estate management, 2.3 Development of community, 2.4 HA focus of community
3. Energy efficiency	3.1 Heating schemes, 3.2 Reduced energy requirements, 3.3 Focus of activity, 3.4 Innovative solutions, 3.5 Regulations, 3.6 Energy sources, 3.7 Implementation
4. Feedback	4.1 Occupancy, development cycle, tenant groups, lack of engagement
5. Fuel poverty	5.1 Cost of heating, 5.2 Condensation, 5.3 Political importance
6. Funding	6.12 Lowest cost, 6.2 Political pressures, 6.3 Innovation, 6.4 Payback costs, 6.5 Certainty
7. Insulation	7.1 High levels, 7.2 Regulations
8. Involving tenants	8.1 Engaging with people, 8.2 Responding to need, 8.3 Matching aspirations, 8.4 Failure to involve tenants
9. Maintenance	9.1 Repair of property, 9.2 Maintenance free, 9.3 Community wide initiatives, 9.4 Maintaining buildings
10. Mixed developments	10.1 Integration in neighbourhoods, 10.2 Retail units, 10.3 Workspaces
11. Mixed tenure	11.1 Waiting lists, 11.2 Social integration, 11.3 Existing communities, 11.4 Special requirements
12. Quality of specification	12.1 Choice of materials, 12.2 Innovation in design, 12.3 Energy efficiency, 12.4 Tenant involvement, 12.5 Commercially driven, 12.6 Contractor involvement
13. Rent levels	13.1 Income level, 13.2 Affordability by tenants
14. Re-cycling	14.1 Availability of material, 14.2 Contractor reluctance



Energy efficiency (feature 3) and Quality of specification (feature 12) generated the broadest range of sub-categories. Within both of theses features the sub-categories ranged from subjective choices on material or technology to the difficulties encountered in delivering solutions through the procurement system. Rent levels (feature 13) and Recycling (feature 14) generated only two or three sub-categories. These features represent the narrowest range of issues, reflecting less relevance of these features to the procurement system. It makes it possible to generalise on the relative importance of the features to the procurement system by considering their breadth within the model. It provides a useful indicator of the perception that each feature has for those involved in the procurement of social housing.

The complexity of the emergent model of sustainability is further developed by the range of connections that emerged through the axial coding process. Use of NUD*IST software and hand coding reveals the relationships discovered between main features and the sub-categories. Development of these relationships increases the complexity of the model. Associations developed between sub-categories increasing the comprehension of sustainability for social housing procurement. These connections are represented on the model by red lines (reduced in number for clarity) (Figure 3.2). Increasing the density of the features allows theoretical components to emerge from the analysis of the data. The components are developed as paradigm models in the following section.

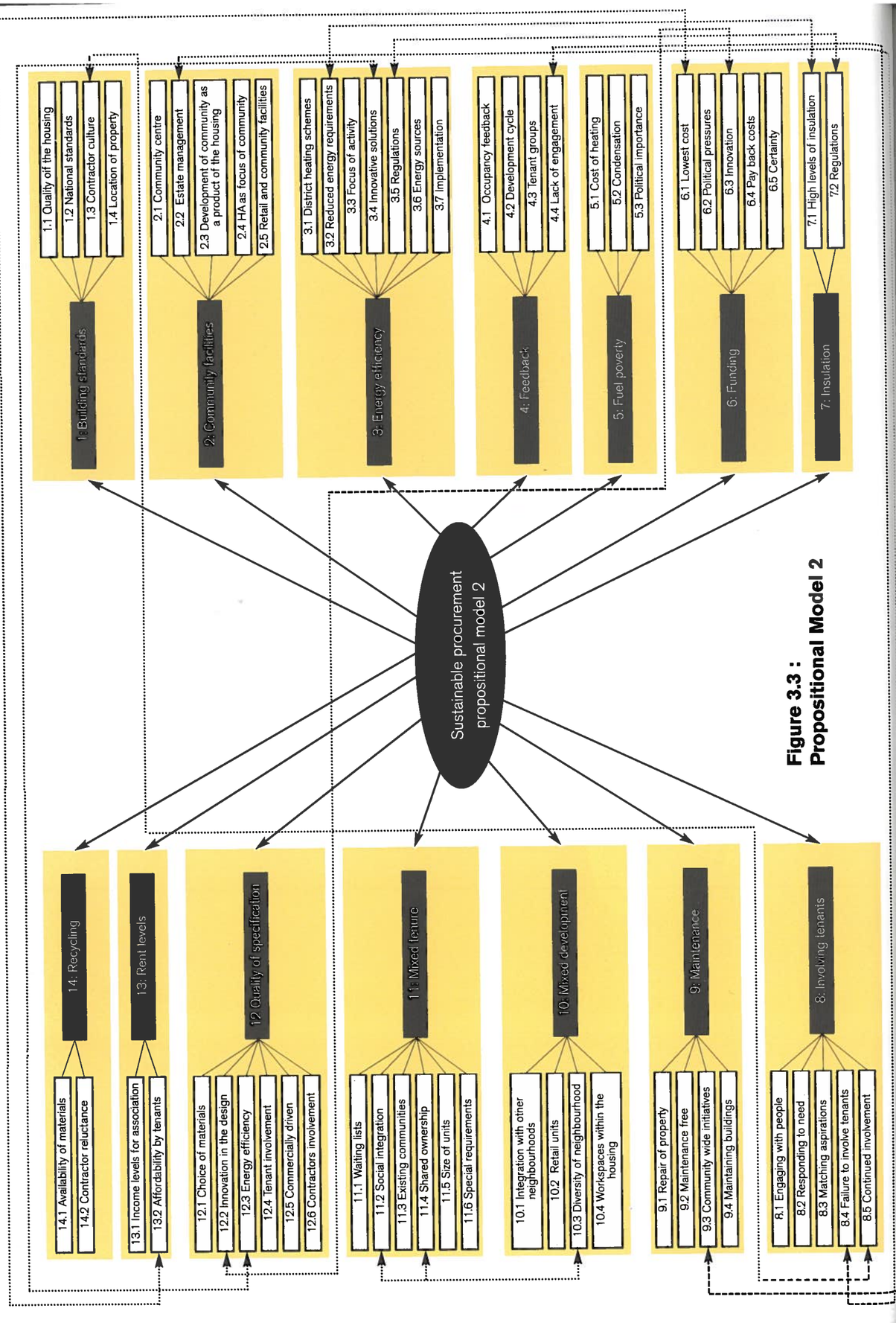
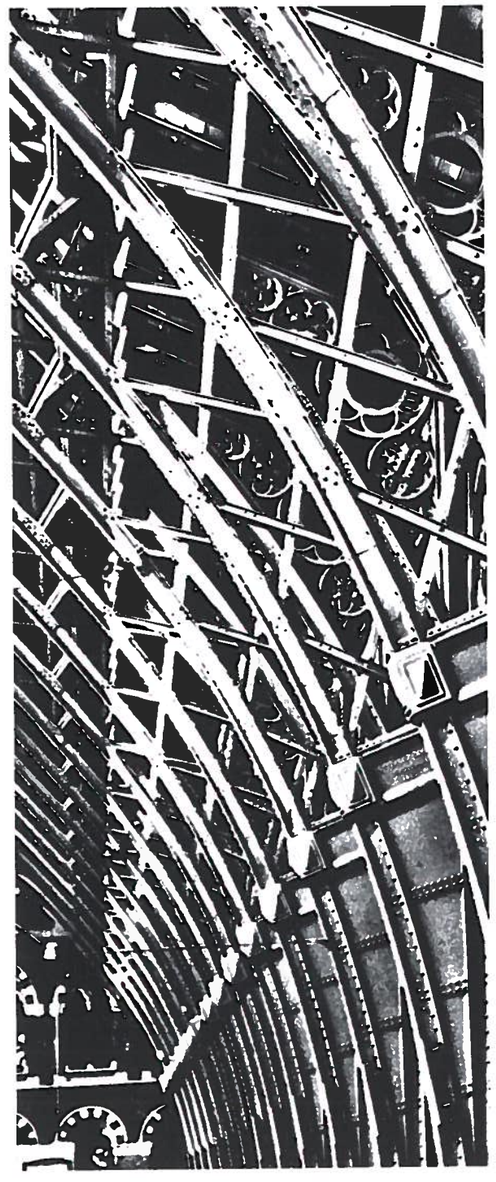


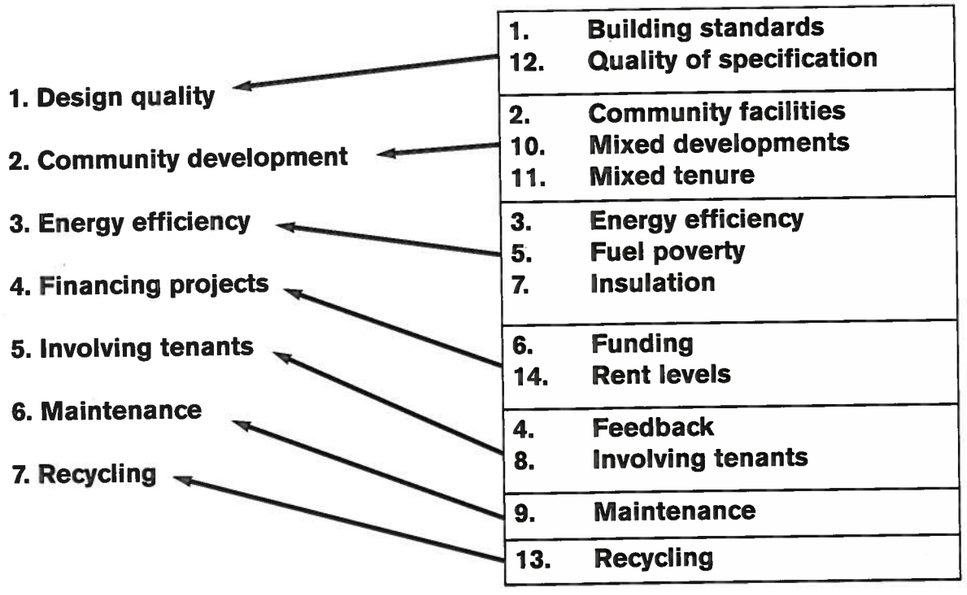
Figure 3.3 : Propositional Model 2



The emergent model (Figure 3.2) identifies a number of features that define sustainability from a project perspective. In order to develop a grounded theory Strauss and Corbin (1990) advocate the use of a paradigm model to analyse each feature or phenomenon. A paradigm model creates a holistic view of each phenomenon emerging from the grounded theory approach. The components of the paradigm model, allow the researcher to explore the conditions and context surrounding a phenomenon and look at the actions being taken in response to it. The use of this model allows a much richer, contextual understanding of the phenomena to develop.

The fourteen features of sustainability were generated out of an iterative process of data collection and analysis. The relationships between the main features of sustainability were explored through axial coding to reveal connections between concepts. The connections consist of similarities and overlap between the categories and sub-categories of the main features developed in the generation of the emergent model of sustainability. This resulted in a number of the features being strongly linked. Many connections were discovered between building standards (feature 1) and quality of specification (feature 12) The feature of energy efficiency (feature 3) held a close relationship with the features of insulation (feature 7) and fuel poverty (feature 5). Community facilities (feature 2) held a strong relationship with mixed development (feature 10) and mixed tenure (feature 11). Funding (feature 6) and rent levels (feature 13) were combined due to the underlying financial aspects of each of the features. A final combination of features

Figure 3.4: Features of sustainability and phenomena for the paradigm models

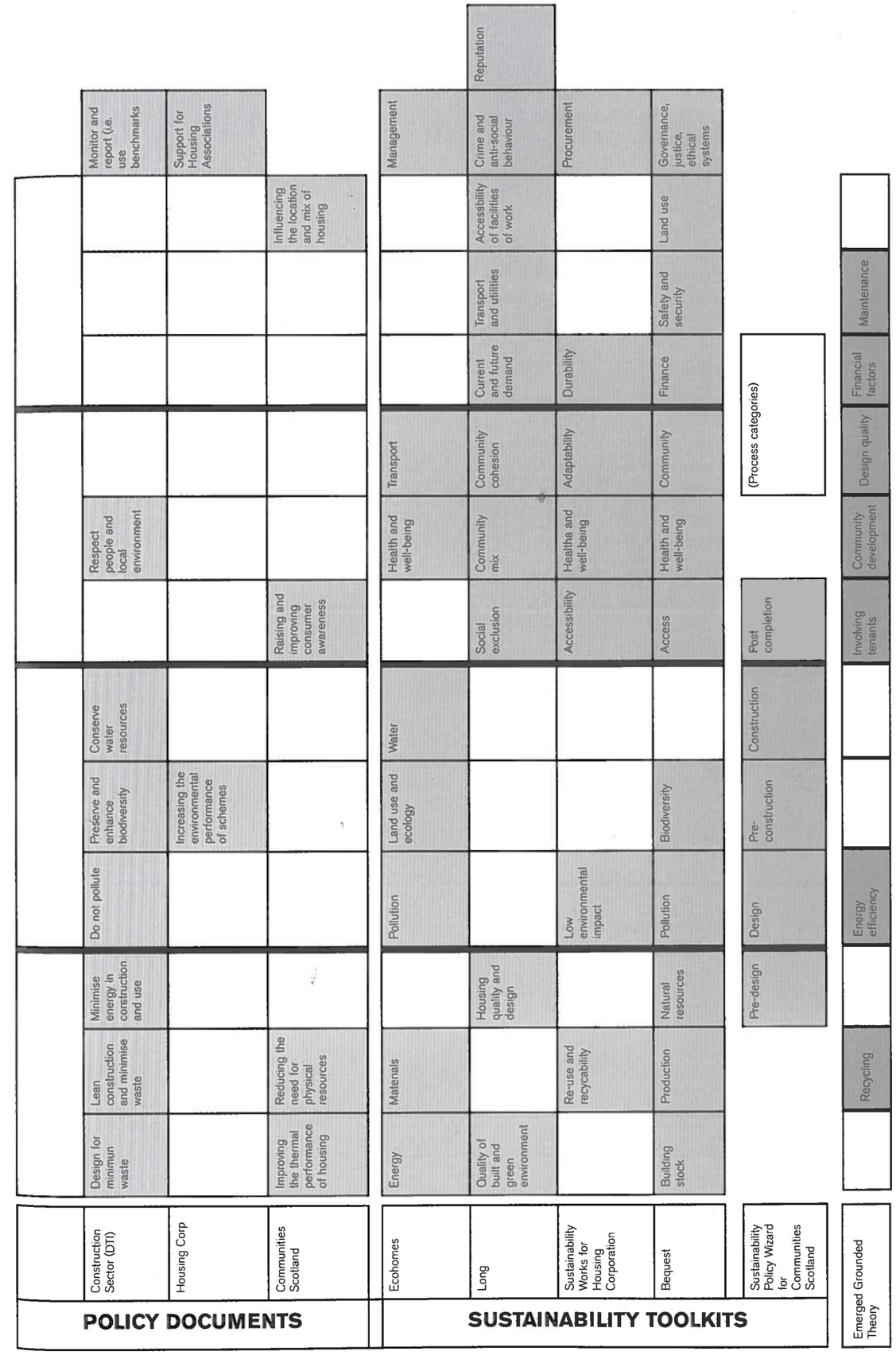


occurred between involving tenants (feature 8) and feedback (feature 4). The fourteen features from the propositional models developed into seven phenomena (Figure 3.3)

The paradigm models constitute the components of the grounded theory of sustainable procurement of social housing (Figure 3.4). The features emerging from the conversations were repeatedly analysed to achieve conceptual density resulting in the seven paradigm models. Each paradigm model has been developed from the same analytical framework (Figure 3.2). The phenomena have been analysed in terms of their contexts and the conditional features that impact upon them. The actions and consequences of each phenomenon of sustainability have been explored to complete the picture.

Comparison of these categories and the policy documents and toolkits (Section 2.2) shows a shift from the environmental bias of the policy documents to the social and economic emphasis of the emergent model and the toolkits (Figues 3.5).

The emergent grounded model presents a set of phenomena that relate the concept of



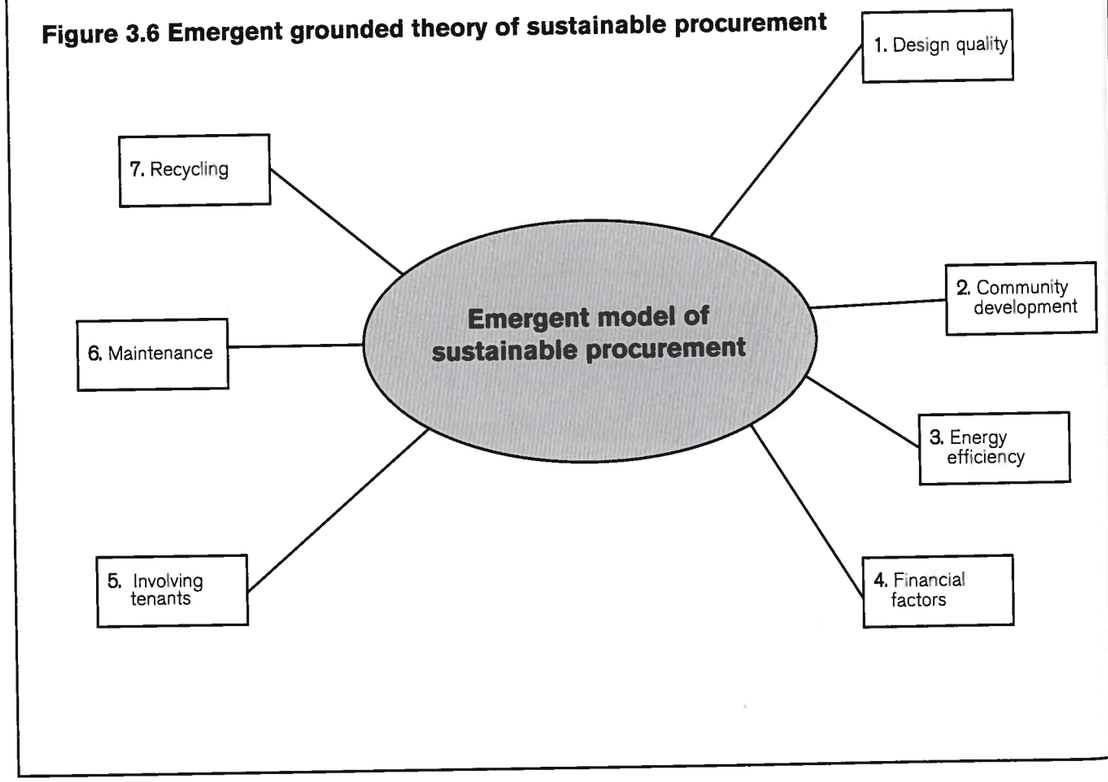
sustainability to the procurement of social housing. The concepts that form the paradigm models constitute elements of a grounded theory.

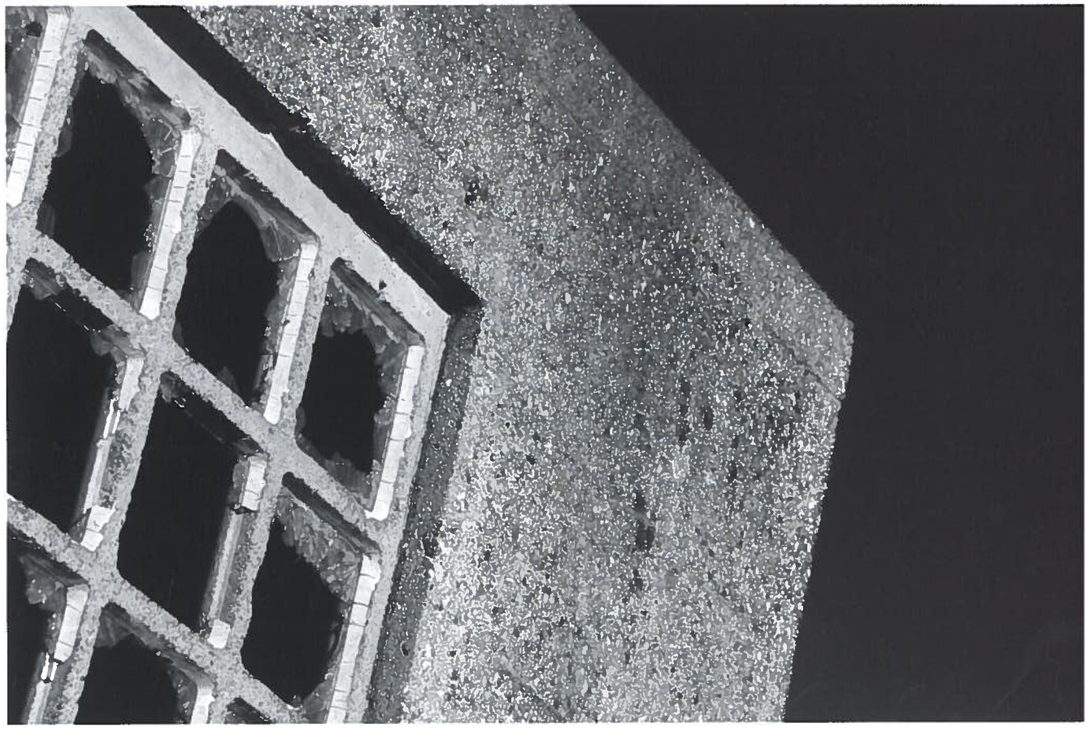
3.5 Summary

The concept of sustainability has emerged into the social housing sector driven by policy that seeks to incorporate global and national definitions of sustainable development. The aim is that housing associations incorporate the policy level aspirations into the procurement of social housing projects. It is clear from the literature that there is uncertainty over the ability to translate these aspirational goals into deliverables at project level.

The ideas that emerged from the grounded theory approach produced a rich picture of social housing procurement from a bottom up approach. The differences that can be seen between the frameworks of sustainability and the project level perceptions provide a measure of the distance between what is agreed at a strategic level and what is perceived by those involved in the delivery of the social housing.

Figure 3.6 Emergent grounded theory of sustainable procurement





The procurement process is the 'system' by which sustainable social housing is delivered. A systems approach asks that the 'system' is modelled and compared with real world situations to identify areas where desirable change could be made. The following section presents the next phase of research used to test the grounded model of sustainability within the real world of social housing development.

4 A Consensual sustainability model

4.1 Introduction

This section develops and tests a decision support tool for use in the procurement system. The tool provides a framework for making sustainability features explicit to those involved in procuring social housing and provides a means to reaching consensus on the relative importance of those features.

The development of ConSus is based on the "Delphi method". This is a systematic, intuitive forecasting procedure used to obtain, exchange, and develop informed opinion on a particular topic. It involves a series of stages. After each stage has been completed, the results are made known to the rest of the group before a second iteration of the process. After each round the experts refine their opinions and a broad consensus emerges. This is taken to be the opinion of the group. This process has the aim of allowing the "experts" involved in an individual housing development to arrive at consensus on what sustainability means for social housing at that level. ConSus develops this idea by incorporating a qualitative element to the collation of issues relevant to the stakeholders. Ultimately it is envisaged that the decision support tool may be used from a single project through to strategic planning of a large scale development programme. This will allow the overall mapping of sustainability features back to policy level.

4.2 Methodology

This phase of research was concerned with the development and testing of a consensual sustainability model. It was resolved to adopt a Delphi study-like approach for this phase of the work. Detailed descriptions of the theory and applicability of Delphi studies can be accessed in work by Li and Shen (2002), Ding (2005), Barrett et al (1999), and Linstone and Turroff 2002). A Delphi approach is able to encompass both quantitative and qualitative data. A mixed methodology is integrated into the framework of ConSus.

This approach attempts to capture the subjective and qualitative aspects of sustainability as viewed by a project's stakeholders and place them into the quantitative project procurement system in a transparent manner. This is aimed at presenting issues explicitly that are of importance to stakeholders within the procurement process. Each of these issues are prioritised and so a consensus position can be achieved for the group.

> *Delphi may be characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem.* (Linstone and Turoff 2002)

The Delphi concept is concerned with the use of expert opinion. The objective of a Delphi study is to "*obtain the most reliable consensus of opinion of a group of experts ... by a series of intensive questionnaires interspersed with controlled opinion feedback.*" It is a technique that is used to develop a shared view of a complex problem. It involves a combination of data collection, prioritising of issues and iterative feedback. Delphi can be used to evaluate a past event or forecast the outcome of a complex situation. It main strength is the learning process furnished by the evaluation of a topic by a panel of experts (Coccia 2000).

4.2.1 Controlled feedback and anonymity

Delphi differs from an ordinary polling procedure. Feedback is gathered from the group and individuals are given the opportunity to modify or refine their judgments based upon their reaction to the collective views of the group. Thus an iterative process is developed to lead the participants towards a consensus on a complex issue. Each respondent completes the questionnaire and then the entire groups responses are compiled to provide a ranking of views. The results are circulated to the group. Additional comments and categories are made available at this time.

A Delphi may be interspersed with a forum or workshop designed to allow opinions to emerge on the rankings. This approach has the benefit of incorporating a much stronger qualitative base into the research, than can be achieved by the use of questionnaires alone.

Each iteration involves the collection of feedback on a group of topics and a statistical analysis of the results. The process can be repeated until consensus has been achieved. One of the strengths associated with a Delphi study is that of anonymous response. This is designed to prevent a dominant individual having a persuasive effect on the group. This aspect of the study is thought to encourage greater freedom to express personal opinion. This in turn means that the response will be based on the individual's expertise rather than the corporate position of the individual's organisation. This is especially relevant when individuals from a single organisation are brought together for a Delphi, but it makes as much sense to provide anonymity to a broad participant population.

4.3 The decision support tool development

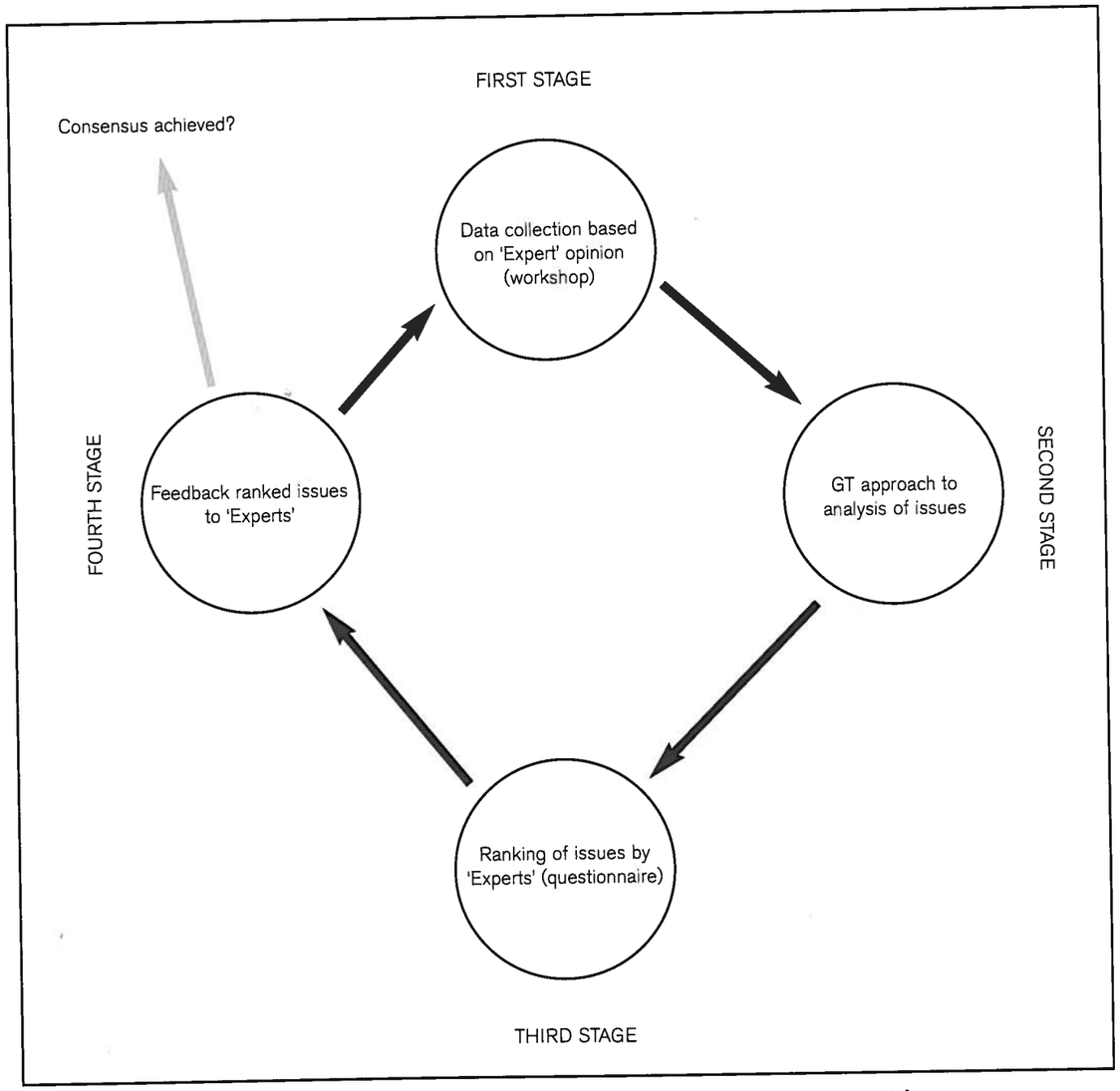
As set out above the Consensual Sustainability decision support tool (ConSus) has been developed to integrate a consensus into procurement decision making to ensure an equitable representation of sustainability in a housing project. The ConSus has been designed to allow a group of individuals to share their expertise. It is based on the principles of a Delphi-like approach and incorporates a qualitative and quantitative analysis framework.

The need for a simple and effective way of integrating sustainability in the decision making process was identified while reviewing the literature. ConSus has been designed to be visually simple to understand and use, and quick to compile responses.

ConSus follows an iterative process. It is envisaged that the decision support tool could be used to formulate policy or prioritise development decisions at programme or project level. The conclusion of each use of ConSus can then be used to assess the expressed priorities of a single project against the overall sustainability priorities of a programme or policy. The use of ConSus is iterative and can be used repeatedly until consensus has been reached. Sustainability priorities may evolve and change over time. It is possible to integrate the use of ConSus into policy planning or annual development cycles to revisit the issues that were prioritised and consider if they are still relevant.

ConSus involves a four stage process - Collection of opinions; analysis of issues; ranking of issues; and feedback of issues. The ConSus decision support tool involves the use

Figure 4.1: A single iteration of ConSus



of a workshop to collect the opinions of participants. This format is designed to elicit a broad and representative range of issues for the group. The aim is to generate as many issues as possible that relate to sustainability in the procurement of a building project for the specific group of stakeholders. The issues are then analysed using the coding paradigm of grounded theory approach (Strauss and Corbin 1990). At this stage all issues are

given equal status. The process results in a set of categories and sub-categories that are used as the basis of a ranking process. The third stage of the process is for participants to prioritise the issues emerging out of the first stage. The ranked issues are presented to the participants. At this stage the participants are given the opportunity to provide further categories and provide their opinion on the responses. This process will either provide consensus on the issues or lead to a further iteration of the process (Figure 4.1). The process may be repeated until consensus is reached or significant differences in opinion are identified. Each round is a complete iteration of the process. ConSus may be used by any number of participants. Delphi studies have been conducted successfully with ten participants (Hatush and Skitmore 1997, Chan et al. 2001) but there are cases of up to three hundred people involved in large scale studies. In the procurement of a project it is possible for all project stakeholders to be involved in use of ConSus.

4.4 Selection of participants

The original group of experts were drawn from an alliance of housing associations involved in a flagship partnered development programme. The initial plan was to develop ConSus for use by the partnering organisations to agree the features of sustainability that would form the foundation of the sustainable development policy for the alliance's development programme.

The first workshop was conducted in mid 2004. This event was a successful meeting and provided the foundations for the ConSus model. Following the workshop, the alliance of housing associations invited to take part in the Delphi study were involved in a strategic reorganisation. The main contact for the Delphi study was replaced and significant organisational change took place. This caused the trial of the ConSus model to stall. Support for the study was forthcoming from the new contact within the reorganised Alliance.

A new group of experts was selected in order to allow the Delphi study to continue. It was decided that due to their expression of interest and assumed enthusiasm for the topic, each of these respondents would be invited to take part in the study. Fifty six development managers within responding housing associations were contacted individually. Emails were sent to addresses supplied by respondents completing the survey. Fifteen of these were 'bounced back'. Checking of email addresses revealed two had been input incorrectly. These were revised and resent. In total forty five development managers were contacted. They were all offered the chance to withdraw from the study. One request was received for removal from the study database and one had stopped working for one of the specific housing association. Forty three development managers have been included for inclusion in the study.

4.5 Preliminary workshop

As the participants in the study were widespread geographically it was decided that a web-based application was ideal to provide an accessible and interactive format for the study. The application was developed using Macromedia Dreamweaver® and the use of html files. The development of a website allowed a range of support information to be included to allow participants access to as

much or as little information as was required. This added to the flexibility of the support tool and increased the user functionality. The participants were provided with information but were not obliged to refer to it to access ConSus. Links were available to the housing agencies' sustainable development policy documents and various other sources of information on sustainability related to the development of social housing. Information on the Delphi method was also made available to ensure that the process was transparent and the participants understood fully the aim of the exercise. The website reported on the initial workshop and directed the participants to complete a questionnaire which constitutes the first ranking phase of the ConSus model – see Fig 4.2.

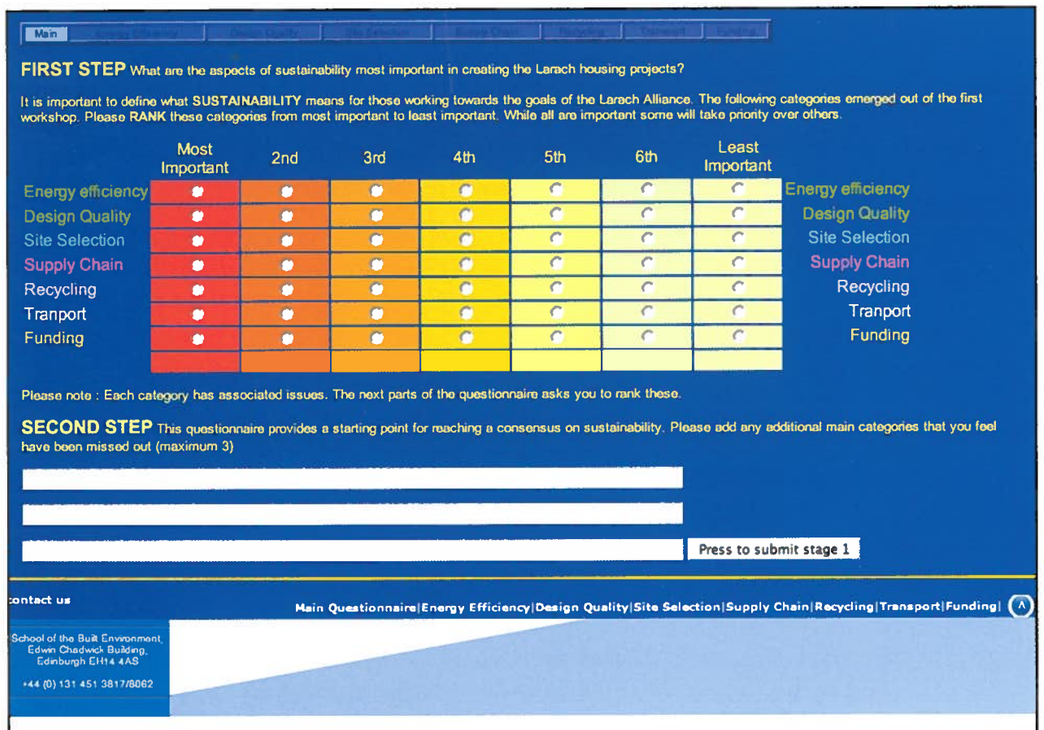


Figure 4.2: Screenshot of ConSus core page with links to additional information

The first stage in the use of the ConSus model was a workshop that was held with invited participants to discuss and develop arange of issues relating to sustainability in the procurement of social housing. These issues would form the basis of the first round of the questionnaire. The original Delphi method involves the researcher compiling the list of issues from literature. This study uses an alternative approach, focusing on the grounded theory method and the importance of basing the system model on the cultural system that is central to SSM. The use of a workshop has the benefit of the issues used for the questionnaire coming from the participants – so called 'experts'. This ensures that the issues are grounded in the cultural system that forms the basis of the procurement system. It reduces the bias of the researcher and ultimately grounds ConSus within the procurement system rather than an observation or interpretation of the process.

The workshop involved five participants and two researchers. The format of the workshop was designed to promote a free flowing discussion in order to allow as many ideas and issues to emerge. The participants were asked to note down ideas, issues and features relating to the three main aspects of sustainability – social, environmental and economic which are the conventional triple bottom line approach.

Each aspect of sustainability was dealt with in turn. The participants were instructed to write down any aspect or feature that they believed was relevant to sustainability. The use of multiple 'post-its' encouraged the generation of a large number of responses from each participant. They were encouraged to use phrases, sentences or single words as they saw appropriate. Each data collection round was allowed fifteen minutes. At the completion of each round, the individuals were asked to attach their notes to a large sheet in groups of similar issues. Once all the ideas were presented, the group set to arrange the ideas into key areas. This process allowed the participant to review their output and consider a relevant grouping for each 'issue'. The process set up a discussion that brought out further ideas that were noted down by one of the researchers and added to the range of issues that had already been produced.

The workshop continued until all ideas had been exhausted. The workshop lasted for two hours and resulted in a 'mind-map' generated by the group of factors related to each of the social, economic and environmental features of sustainability.

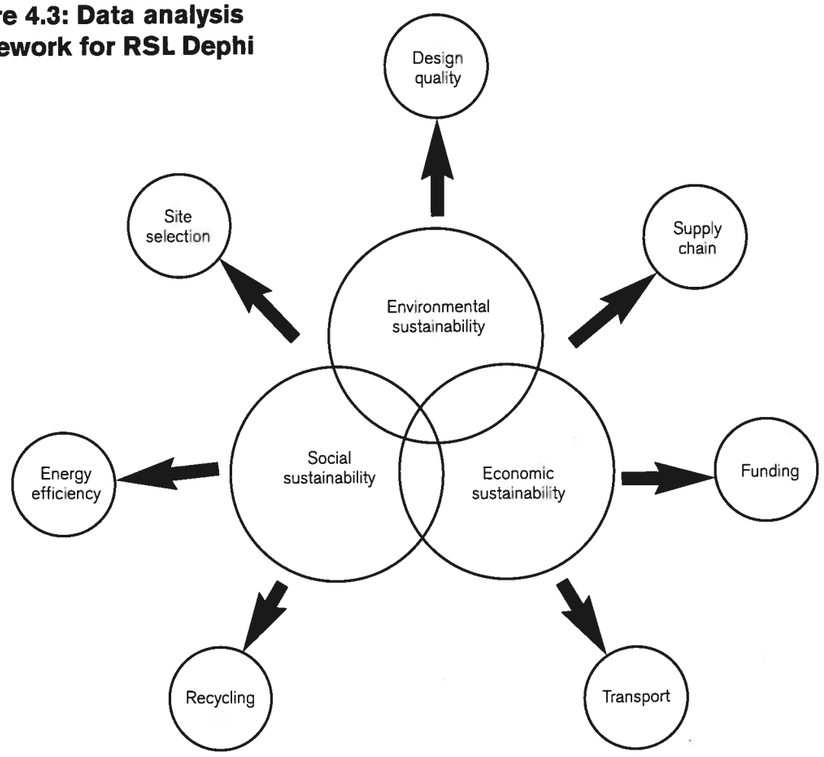
Analysis: Following the workshop the issues were transcribed and compiled into lists under the headings of social, economic and environmental. The issues that emerged out of the workshop were analysed using the coding paradigm developed for grounded theory. The issues that emerged were categories that represented areas relevant to the participants. Further analysis made use of these categories and started to search for patterns and relationships that existed between different sets of categories. The original analysis framework was based on the triple bottom line model of sustainability. The subsequent analysis removed this framework and allowed the categories to be arranged in relationships that transcended the notional boundaries of the original framework. This promoted the development of new categories that captured a range of issues under new headings.

The analysis continued through several

waves to arrive at a range of categories that were thought to represent the perceptions of sustainability from the participants at the workshop. The categories were arranged into a hierarchical structure. The main categories represented seven issues that predominated in the conversations. Each of these seven categories is populated by a range of sub-categories (Figure 4.3).

The categories that emerged from this analysis process represent the broad issues that the group generated to represent their views of sustainability. The sub-categories within these main categories expand each category to provide a framework of issues that apply to the procurement of social housing. The use of a framework that differs from the triple bottom line model encourages a 'bottom up' perspective to develop that is relevant to the individual project environment. The use of this approach to the development of ConSus grounds the whole process in the procurement system.

Figure 4.3: Data analysis framework for RSL Dephi



4.6 Delphi questionnaire 1

The seven categories and their sub-categories that emerged from the analysis of the output of the workshop formed the basis for Delphi questionnaire one (Table 4.1).

The questionnaire was dispatched via webmail to each of the Delphi study participants (see previous section) and the respondents were asked to place the categories in order of their importance for the delivery of sustainability. The main categories were ranked first followed by ranking of the sub-categories.

The questionnaire was arranged in eight pages. The first page presented the seven main categories that emerged from the workshop – see Fig 4.4. The following seven pages were the sets of sub-categories that related to the main categories. Following the ranking of each category the respondents were asked to consider any areas that had not been included and were significant to the specific set of categories or sub-categories. The respondent was provided with three text boxes to input their responses. The limitation to three areas promoted a focused approach rather than an inclination to throw ideas at the page.

Results: Round 1. The first questionnaire produced sixteen responses. This constitutes a response rate of 37%. This was achieved following three rounds of emails sent to all recipients. This process resulted in two respondents dropping out of the process. The remaining respondents are assumed to want to take part in the study.

The responses from the survey were emailed back and the data was compiled in a Microsoft excel spreadsheet. The data was imported into SPSS and analysed to compare the means, using a Kendall's W test. The use of this statistical test provides the mean score for each response and the coefficient of concordance that demonstrates the level of agreement present in the full range of scores. The closer the score is to 1.000 the more agreement there is within the group. The

Table 4.1: ConSus issues of sustainability (main categorioes in bold) in alphabetical order

Design quality	Energy efficiency	Funding	Recycling
Aesthetic design and detailing	Alternative fuels	Cost effective to build	Adaptability
Choice of materials	Avoidance of fuel poverty	Individual affordability	Demolition and demountability
Contribution to neighbourhood	Building orientation	Private funding	Energy from renewable resources
Flexibility and adaptability	Earth moving minimised	Public funding	Funding sites with mixed use
Health promoting housing	Education on energy use	Running costs of property	Recycled materials
Integration of safety and security	Efficient transport policy	Small incremental change	Recycling by occupants
Maintenance and ageing of buildings	Improved boilers	Sustaining local economy	
Replicability of project	Low embodied energy		
	Reduce polluting emissions		
	Reducing use of water		
	Thermal performance		

Site selection	Supply chain	Transport	
Affordable sites in areas of need	Contractors site operations	Cost implications of transport issues	
Close proximity to contractors	Cost savings through the supply chain	Integration within community	
Density linked to demand	Funding sites with mixed use	Linked to transport network	
Integrated within community	Inclusion of local labour and contractors	Reduction in car use	
Links to transport network	Innovation through the supply chain	Transport consequences of the development process	
Local benefits of project	Renewable materials		
Redevelopemt of sites	Transport of materials		
Site orientation and amenity			

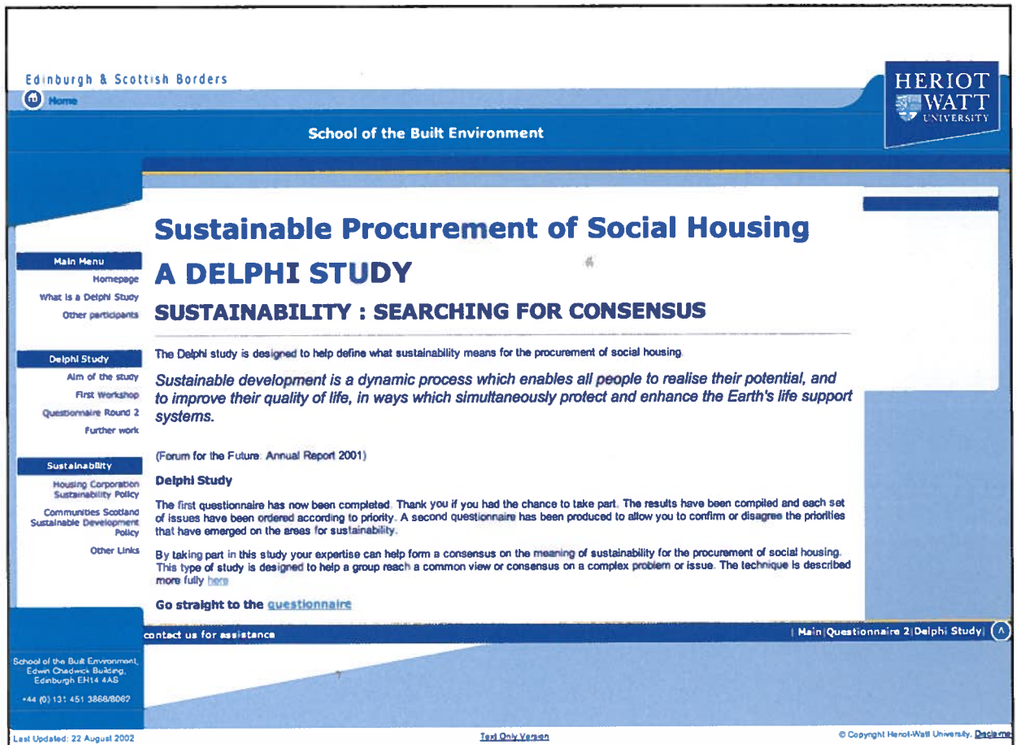


Figure 4.4: Screenshot of Delphi questionnaire round 1- page 1

ranking for the main categories is presented in Table 4.2.- Design Quality; Energy Efficiency and Site Selection emerged as the top three categories. The Kendall's W for this ranking is 0.492 which does not demonstrate a very strong level of agreement amongst the respondents. The statistical significance is .000 which indicates that the ranking has not occurred by chance.

The sub-categories for each of the main categories were analysed in the same way and are illustrated in Table 4.3. Firstly the ranking score was derived by calculating the mean score followed by the Kendall's W (Coefficient of concordance).

The degree of agreement in the ranking of the main categories was not apparent in all

Table 4.2: Ranking of main issues for sustainability

Main question	Ranking	Category	Mean score
	1	Design quality	2.45
	2	Energy efficiency	2.91
	3	Site selection	3.00
	4	Funding	3.09
	5	Transport	4.55
	6	Supply chain	5.82
	7	Recycling	6.18
Kendall's W: 0.492 Significance 0.00			

the sub-categories. Design quality; Supply chain; and Recycling all had a low level of agreement on the ranking and the results were not statistically significant. The categories of Funding and Energy Efficiency received the highest level of agreement between respondents. The sub-categories considered most important for each main category have a strong social bias. This reflects the results that have emerged out of the previous grounded theory study. The categories that cannot be specifically grouped under social sustainability have a noticeably environmental bias.

Table 4.3: Ranking of sub-categories for sustainability

Design quality (Main rank 1)	Mean rank	Kendall's W (significance)
Maintenance and aging of buildings	3.33	
Flexibility and adaptability	3.78	
Contribution to neighbourhood	3.83	
Integration of safety and security	4.33	
Aesthetic design and detailing	4.94	
Choice of materials	4.94	
Health promoting housing	5.17	
Replicability of project	5.67	0.109 (0.445)
Energy efficiency (Main rank 2)	Mean rank	Kendall's W (significance)
Thermal performance	2.75	
Avoidance of fuel poverty	3.56	
Improved boilers	4.50	
Reducing use of water	4.88	
Reduce polluting emissions	4.88	
Education on energy use	5.88	
Low embodied energy	6.38	
Efficient transport policy	6.88	
Building orientation	7.88	
Alternative fuels	8.31	
Earth moving minimised	10.13	0.437 (0.000)
Site selection (Main rank 3)	Mean rank	Kendall's W (significance)
Integrated with community	2.88	
Affordable sites in areas of need	3.25	
Density linked to demand	3.81	
Redevelopment of sites	3.88	
Links to transport network	4.06	
Site orientation and amenity	4.88	
Local benefits of project	5.50	
Close proximity to contractors	7.75	0.404 (0.002)

Funding (Main rank 4)	Mean rank	Kendall's W (significance)
Sustaining local economy	2.22	
Cost effective to build	3.17	
Small incremental change	3.33	
Individual affordability	3.61	
Private funding	4.06	
Public funding	4.61	
Running costs of property	7.00	0.496 (0.000)
Transport (Main rank 5)		Kendall's W (significance)
Integrated within community	1.78	
Linked to transport network	2.11	
Reduction in car use	3.33	
Transport consequences of the development process	3.83	
Cost implications of transport issues	3.94	0.400 (0.006)
Supply chain (Main rank 6)		Kendall's W (significance)
Inclusion of local labour and contractors	3.11	
Cost savings through the supply chain	3.22	
Renewable materials	3.89	
Innovation through the supply chain	4.06	
Funding sites with mixed use	4.33	
Transport of materials	4.39	
Contractor's site operations	5.00	0.096 (0.523)

In themselves the results provide an interesting perspective on the views of a group regarding sustainability in the procurement system. However the correlation coefficients for the full range of results demonstrated a low to medium level of agreement within the group. The aim of the ConSus model is to assist a group in reaching consensus and the single iteration of the process has highlighted a range of different opinions on sustainability. This position determines that a further iteration of the ConSus model was required and a second questionnaire was compiled.

4.7 Delphi questionnaire 2

The results from the first Delphi questionnaire were used to create the second round questionnaire. The web-based template was modified to represent the ranking of sustainability issues, reflecting the mean response of the group. The first page of the questionnaire presented the overall ranking for the main categories. These were arranged from most important to least important. The subsequent questionnaire sheets were arranged to appear in the order of the main issue ranking, namely: Design Quality; Energy Efficiency; Site Selection; Funding; Transport;

Supply Chain; and Recycling. Within each of these questionnaire sheets, the sub-categories had also been rearranged to reflect the group's ranking that had resulted from the first round questionnaire. In each questionnaire sheet, the target button for each category was already checked to reflect its relative importance. This gave the respondent the opportunity to submit the sheet without making alterations. By doing this they were expressing their agreement with the ranking of the categories.

The respondents were asked to consider the group's ranking and make any alterations to the level of importance that had been allocated to any of the categories.

Results: Round 2. The second round of the questionnaire produced a response rate of 50% from the first round respondents. This was achieved from two rounds of emails inviting participation in the second questionnaire. Five respondents completed the whole questionnaire and two completed only the main page. The response rate reflects a reasonable retention rate in the study. The trial of ConSus is not goal driven and there is not commercial pressure to remain within the study. The response rate then may be considered good considering participation is not linked to a specific project.

The majority of respondents indicated a total agreement with the ranking of the categories throughout all section of the questionnaire. Two respondents completed the main questionnaire sheet and their agreement

Table 4.5: Consensus of main issues for sustainability

Main question	Ranking	Category	Mean score
	1	Design quality	1.14
	2	Energy efficiency	2.29
	3	Site selection	3.00
	4	Funding	3.57
	5	Transport	5.00
	6	Supply chain	6.00
	7	Recycling	7.00

Kendall's W: 0.939 Significance: 0.000

is assumed for the sub-categories. Ideally explicit agreement would be gathered from all participants in the process. With implicit agreement there is a chance that later in the procurement process the individual may express dissatisfaction with a decision based on the consensus derived by use of ConSus. However, implied agreement provides a more robust position than a scenario with a high degree of explicit disagreement.

The ranking established by the group as a result of questionnaire one has proved acceptable to the group. Table 4.5 illustrates the level of agreement has increased on the ranking of these issues. The Kendall's W statistic is 0.939 (sig. 0.000) indicating a very high level of agreement amongst respondents. This has increased from a Kendall's W of 0.492 following the first questionnaire.

The mean scores indicated in Table 4.5 that represent a whole number indicate total agreement for a category. Design quality, Energy Efficiency and Funding presented low levels of difference in opinion between the respondents. The sub-categories of each of the categories ranked in the main questionnaire received a total level of agreement for their ranking in all but one case. The ranking of issues (Table 4.3) was tested for level of agreement and in all but one case a Kendall's W of 1.000 (sig. 0.000) was achieved. This indicates total agreement between the group. The Design Quality sub-categories achieved a Kendall's W of 0.998 (sig. 0.000). This was as a result of on respondent shifting one sub-category from sixth to seventh position.

The second round questionnaire resulted in an almost complete agreement on the issues of sustainability and their relative importance in the procurement of a project. It was therefore not necessary to complete another iteration of the ConSus model. The ranked output of ConSus provides the group with a range of issues that represent their combined priorities of sustainability.

Analysis: The use of the ConSus model – see Fig 4.5 reveals seven main categories of sustainability that are important to the group of stakeholders involved in the trial. These

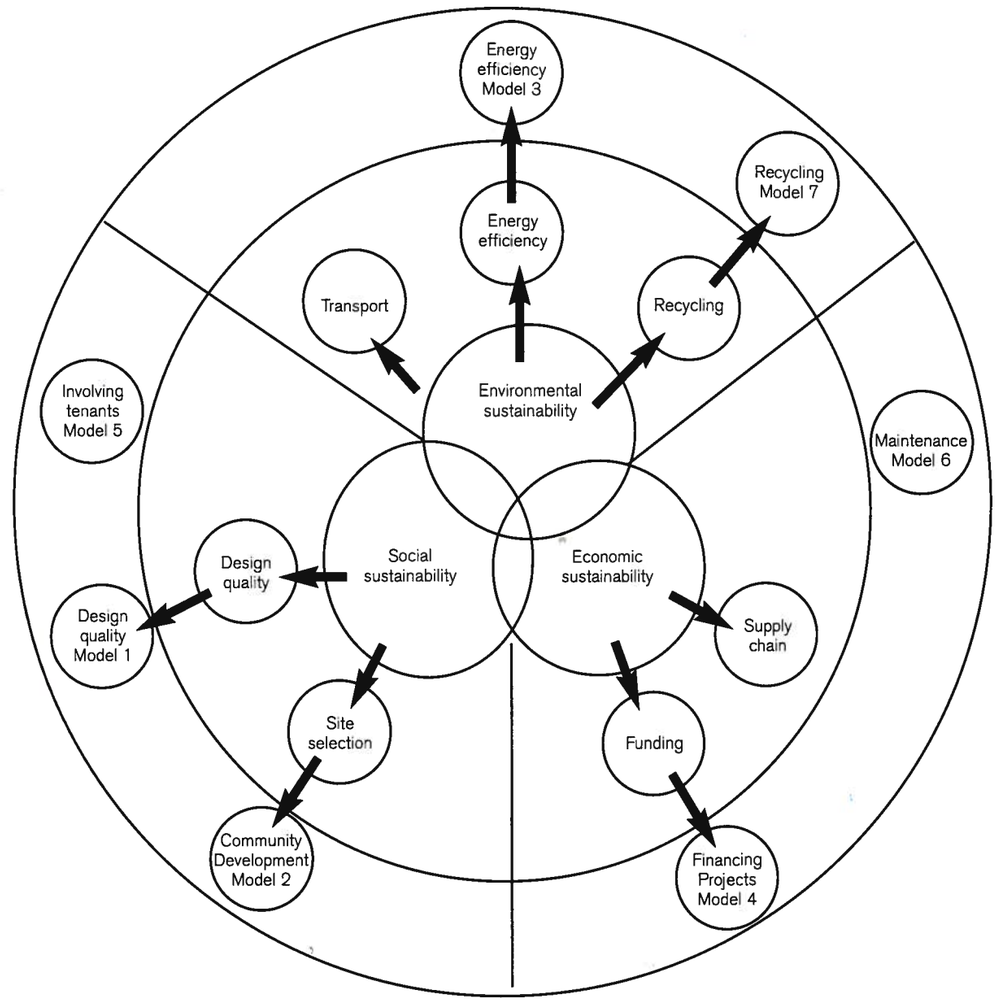


Figure 4.5: Analysis of ConSus features and grounded model

issues are specific to the iteration of ConSus and represent the 'expert opinion' of those involved. This research has been concerned with the interpretation of sustainability at project level and the problem that the gap between policy and practice presents. The issues emerging from the ConSus model are representative of a small section of the social housing sector and although not project specific (in this case) are potentially different to the emergent grounded theory of sustainability developed in the earlier phase of research. For the ConSus model to integrate with the overall view of sustainability it is necessary to compare the features emerging out of the iteration with a broad view of sustainability to understand how a project contributes to the broader understanding of sustainability. The features from the ConSus model are compared with the grounded theory of sustainability developed in the earlier phase of research. This framework allows the

The ConSus model prioritises issues within the procurement of a project and provides a framework for decision making.

interpretation of sustainability of a project to be compared with a broader understanding of the concept.

Five of the seven categories developed in the ConSus model coincide with the paradigm models developed in the grounded theory. Involving Tenants (Model 5) and Maintenance (Model 6) did not emerge in the stakeholders taking part in the ConSus model. Supply Chain was developed as a category that did not correspond directly with the any of the grounded models, but elements of supply chain are contained within the Design Quality model and the Maintenance (Model 6). Transport is a new category of sustainability that is important to the stakeholders in this study that did not emerge in the grounded model.

The comparison provides an element of dynamic process to ConSus. The issue of moving towards the goal of sustainability is a preoccupation with those involved in sustainable development (Bell and Morse 1999). The dynamic modelling that is achieved by comparing the views of sustainability over time can be used to track progress towards a goal.

4.8 Summary

The successful trial of the ConSus model with a group of housing association development managers has resulted in a set of categories that have been prioritised to aid decision making in relation to sustainability. The consensus achieved through the use of ConSus provides a framework for addressing sustainability issues in the procurement of a project. Ideally decisions in the procurement system can be made that acknowledge the groups concerns for sustainable development identified by the ConSus model.

The previous phases of research have established an emergent grounded model of sustainability comprising out of fourteen features, expressed through seven paradigm models. The categories emerging from the ConSus model were compared with the grounded model of sustainability. Substantial overlap between the grounded model and the ConSus model existed (Figure 4.5). Five of the paradigm models were directly related to five

of the categories that had emerged out of the ConSus workshop. The remaining categories of 'Transport' and 'Supply chain' had not emerged strongly in the grounded model, but were represented at the lower levels of the 'Design quality' model (paradigm model 1). The paradigm models of maintenance and involving tenants were featured as sub-categories in the ConSus model. The differences that have emerged are a function of the use of ConSus. The comparison between one set of features and another can be used to compare emphasis in one project to emphasis in another. This can be used to identify the profile that sustainability is assuming overtime.

The ConSus model prioritises issues within the procurement of a project and provides a framework for decision making. Its use allows subjective decision making to become more transparent and consistent throughout the procurement process. By identifying the group's priorities for sustainability and reaching consensus on the most significant issues, action can be focused by all parties involved in the procurement of a building project.

There is no guarantee that consensus will always be reached. The ConSus model provides the framework for identifying consensus or disagreement within a group of 'experts' or 'stakeholders'. If consensus is not reached by the use of ConSus then it could be argued that the impact of the disagreement can be lessened by the process of using ConSus, which allows an individual to express their opinion through the ranking and present their argument through the workshop or forum.

5 Conclusions, limitations and recommendations

5.1 Introduction

This section presents the conclusions reached from this work. The section is structured to present the main findings of the work. The relevance of the work for academic and practical purposes is then discussed with respect to the generation of new knowledge. Consideration is given to the limitations of this work and proposals for further work as a result of this research are presented. The section is concluded with final reflections on the whole research study.

5.2 Main findings

The aims and objectives of this research were identified in section 1.2 . The following section explains what has been done to address these specific objectives within the paper.

Objective 1 – To investigate the relationships and connections between the procurement system and the global environment. The literature reviewed (section 2) explored the international development of the concept of sustainability. The early concerns for the global environment evolved into the international acceptance of the 'Bruntland' definition that incorporates social, economic and environmental aspects. The review covered the context of social housing procurement and examined a partnered approach to procurement. The outcome of the literature review was the identification of 'filters' to the delivery of sustainability in a building project. These filters were found to influence the transformation of globally defined sustainable development into a project level perception of sustainability (Figure 2.5). Four main filters exist between a housing project and the global definition of sustainability. UK Sustainable Development policy and Rethinking Construction are the two high level filters associated with the development of sectoral policy within the social housing sector and the construction industry. The two filters most closely associated with the delivery of sustainability through social housing projects are Interpretation of SD policy, and the Procurement Approach. These filters form the main strands for investigation within this paper.

Objective 2 - Establish the features of sustainability that are relevant to the procurement of social housing. A grounded theory approach was used to establish the way in which sustainability is understood in the procurement of a social housing project. The research methodology encouraged the development of a model grounded in the procurement system. The grounded model developed (see Fig 3.5) is made up of seven paradigm models that explain the phenomena that relate to sustainability in the procurement of a building project namely, – Design Quality; Community Development; Energy Efficiency; Financial Factors; Involving Tenants; Maintenance; and Recycling. Each of the above phenomena have a number of sub-categories which were found to be considered by project stakeholders and which were dependent upon project circumstances.

Objective 3 - Develop a decision making framework to integrate sustainability into the development of social housing. The grounded theory study established that understanding of sustainability differed significantly between the policies advocated by the social housing agencies and the perception at project level.

This gap presents a difficulty for the housing agencies in assessing projects being put forward for funding, and for the housing associations attempting to gain funding. There is a need for a framework to define what sustainability means for a project so that it can be assessed and more importantly delivered through the procurement system. The ConSus model was developed to provide this framework (section 4). The model is based on the Delphi method of data collection and analysis and its mixed methodology allows the subjective elements of sustainability to be formalised into a framework that can be used to aid the decision making process. The ConSus model provides a set of issues that can be ranked according to the 'expert' opinions of the procurement team. The issues are generated specifically for the project, programme or policy and represent a grounded view of sustainability for a particular situation and time. The benefit of the ConSus model is that all the issues generated are retained as a reference framework to base decisions against during the entire procurement process. It is a dynamic and flexible model designed to adapt to change within project or programme circumstance. Unlike some 'black box' models (Ding 2005; Chen et al. 2005), the output of this model is transparent and encourages the continued use of the framework throughout the procurement process.

The ConSus model provides a framework that responds to the individual criteria placed on each project. It can be used to develop policy frameworks against which individual project frameworks can be assessed against. Ultimately it is a model that responds to the process of time. Iterations of the model can be made for each new project within a programme.

5.3 Relevance for practice

This research was supported by a Richard Lay Fellowship from the RICS Foundation. The work contributes to the broad range of research commissioned by the RICS Foundation to address sustainability in the built environment (Upstream 2004; Edwards et al. 2004). The findings represent a clear step forward in terms of the understanding of sustainability from a project perspective. Where other published research on sustainability has focused on broad policy level initiatives, this research has advanced theoretical knowledge grounded in practice.

The research has potential for improving the way in which RICS practitioners address the issue of sustainability within the procurement of building projects. Consultants must demonstrate an ability to integrate sustainability into the procurement of social housing. Offering clients a structured approach to sustainability is now an essential part of the advice housing associations require. The ConSus model provides this structured approach and presents a tool for aiding decision making towards meeting the objectives of the housing agency funding body. More importantly it stands to integrate sustainability more effectively into new social housing projects. As an increasing sector within the construction industry this has a relevant role to play in helping the construction industry as a whole become more sustainable.

Each phase of this research has been firmly grounded in practice. The propositional model emerging out of the grounded theory

study was formed from the perceptions of the practitioners. The social housing sector is inundated with practical guidance and policy rhetoric on what sustainability means. The toolkits available to the social housing sector (Talbot 2001; Long 2001) provide comprehensive but overwhelming lists of actions that housing associations are recommended to incorporate into their projects. This research has revealed a need for project specific assistance on integrating sustainability in a meaningful way. The research addresses this need in the development of a model designed to provide a set of features applicable in practice.

The filters identified in the literature review sift the understanding of sustainable development from its global definition to its interpretation at project level. The most direct influences on sustainable development at project level are the interpretation of social housing SD policy and the procurement approach. Filter one is determined by the expertise, knowledge, perception and experience of the individuals involved in the procurement of a social housing project. Each individual brings their own value laden judgements to the project. The ConSus model aims to formalise these judgements and allow the group of project stakeholders to make decisions that incorporate these influential contextual factors. The development of this model provides a practical tool for use by practitioners involved in the procurement of a building project. When tested with housing association development managers the model proved easy to use and feedback has been positive.

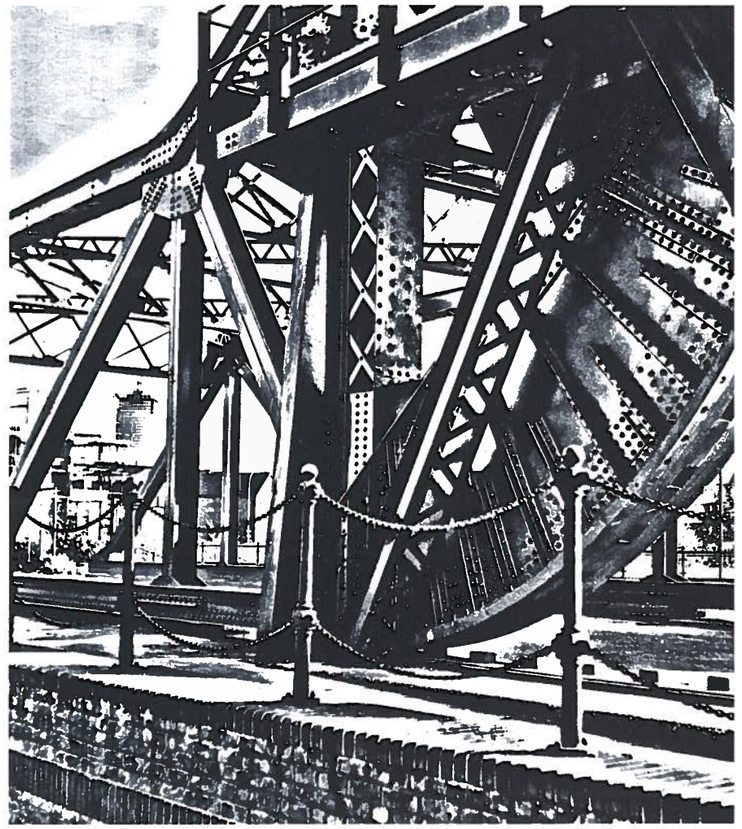
The ConSus model provides a way in which sustainability can be defined for a project. It is designed to incorporate all 'experts' involved in the procurement system and encourage the sharing of knowledge and 'expert opinion'. This aspect of the model makes it especially relevant for use in partnered procurement. Integration of 'expert opinion' can assist in developing a meaningful definition of sustainability.

5.4 Limitations of the research

The research has been conducted during a period of significant change within the social housing sector. Sustainable development was introduced as a funding criterion of social housing procurement mid-way through this research. The effect of this change is difficult to gauge through the findings of the research. The perception of individuals has been developed through a short cycle of experience within the new funding framework. The housing agencies themselves were not clear on how the issue of sustainable development should be dealt with. The changing context of the research means that the findings are based on a shifting concept. This provides scope for additional research in the future. This aspect of the study has been addressed in the development of the ConSus model. It is designed for iterative use to capture the immediate issues on sustainability as they relate to the procurement of a building project. This means that the features of sustainability emerging out of the use of the model can be revisited on a regular basis. This aspect of the model introduces an element of future proofing.

5.5 Recommendations for further work

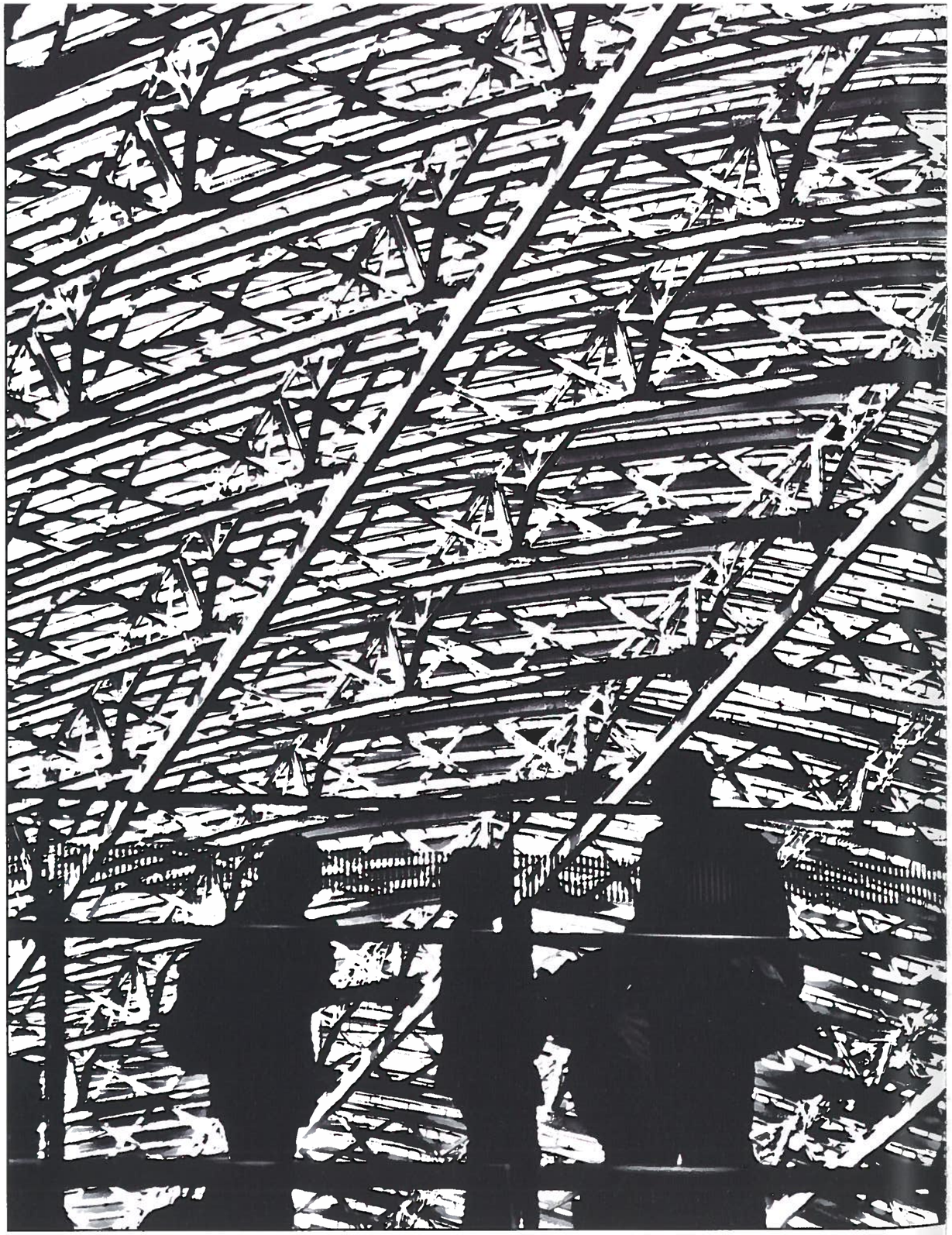
The research has created many potential avenues for further work to benefit both the development of academic and practice based knowledge and expertise. There is great potential for knowledge transfer of the findings to practitioners and the wider academic community. This provides the opportunity to effect incremental cultural change and further refinement of the ConSus model such as,



(i) Development of the ConSus model to increase its interactivity

The ConSus model presently is in a fairly simple format. The model has been designed to present a professional appearance. The web-based application allows the features of sustainability to be input according to the emergent aspects from a workshop. Presently the model collects data from the participants in a format that is not readily collated. The 'behind-the scenes' features of the model will benefit from some improvements.

It is envisaged that the model will incorporate facility for an online forum. In its current format the features used in the model were developed in a face-to-face workshop. This resource would allow a virtual workshop to take place. This permits the sharing of 'expert opinion' between stakeholders that are either spread geographically or not available at



the same time. This option would also allow the feedback on ranked features to happen in anonymity, this is seen as a positive feature of the ConSus model.

Data collection and data collation can readily be automated within the ConSus model. This user friendly feature can be designed to create 'output reports' from the use of the model. These reports present the features and the ranking selected by the group and form a decision aid within the procurement process. Improving certain features of the ConSus model will provide a framework that can deliver usable output for any procurement team within a very short period of time. Ease of use and transparency are important features for the successful application of the ConSus model in practice.

(ii) Development of a grounded theory with general application to procurement projects.
The qualitative research succeeded in developing a grounded model specific to the social housing sector. The approach has proved very successful in producing a meaningful definition of sustainability for a specific sector. This allows an understanding of procurement criteria relating to sustainability to be made explicit. The paradigm models are firmly grounded in the social housing sector. The same grounded theory approach can be used to identify the understanding of sustainability for other sectors of the construction industry. This approach would allow the interpretation of sustainability as it applies to other types of procurement. The grounded model has proved useful in identifying the gap that exists between policy and practice in the social housing sector. By considering other sectors a cumulative theory of sustainability can be built up. Sustainability is essential to the future of the built environment. The concept is still evolving and it is certain that it will become a more important part of procurement in the future. There is scope to repeat the study at a time when sustainability has had time to integrate more fully into the procurement system.

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